



# **Key Findings from Research Understanding for Improvement**

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**NSF/NIH/CGS Graduate Support Workshop**

**AAAS**

**Washington, DC**

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**Policy Evaluation and Research Center**



# Three Aspects of the Doctoral Student Experience that are Critical to Success

- We have the capacity to talk about many aspects of the doctoral student experience but I will focus on:
  - Academic preparation
  - funding arrangements,
  - faculty mentoring,
  - research productivity,



# Doctoral Student Experience Conceptual Model

## Background Characteristics

- Gender
- Race
- Parent SES
- Married/  
domestic partner
- Household Income
- Have kids under 18
- Age

Funding  
Mentoring  
Research  
Productivity

## Doctoral Program Experiences

- Private graduate school
- Had a fellowship
- Served as research assistant
- Served as teaching assistant
- Have a mentor
- Always full-time
- Time in program (years)
- Expect 1<sup>st</sup> job - faculty/postdoc

## Admissions Criteria

- GRE Scores (V,Q,A)
- Selectivity of Undergrad C/U



# **The Understanding for Improvement Sample**



## Three Stage Sampling Plan

- Stage 1 - selected 21 diverse doctoral granting universities
- Stage 2 - selected 11 fields of study
- Stage 3 - selected a stratified sample of  
13,160 doctoral students who completed at least one year of study and who were taking at least 6 credit hours in the fall term 1996



# Participating Institutions

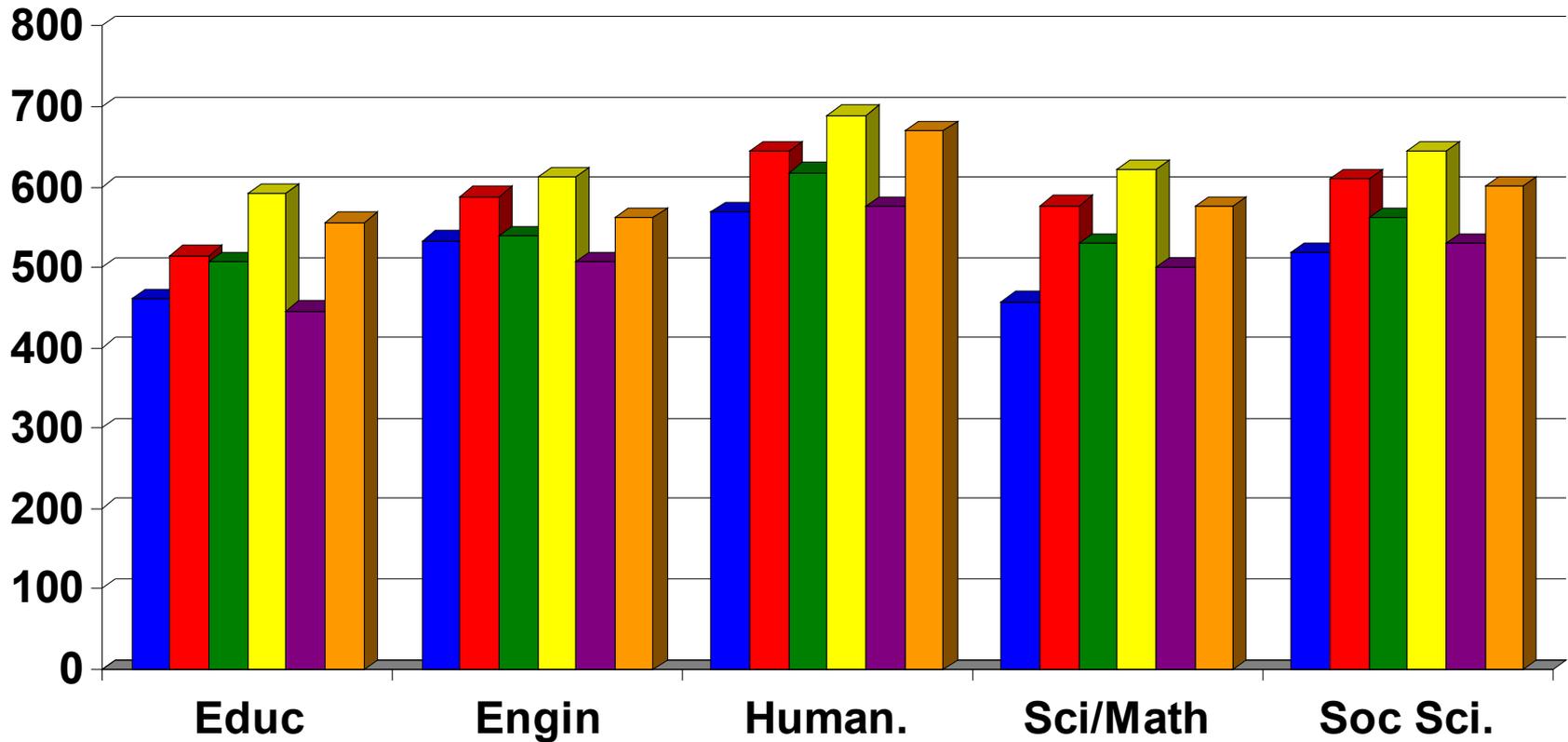
- **Clark Atlanta University**
- **City University of New York**
- **Columbia University**
- **Harvard University**
- **Howard University**
- **Indiana University**
- **New York University**
- **Ohio State University**
- **Princeton University**
- **Rutgers University**
- **Stanford University**
- **Teachers College**
- **Temple University**
- **University of California at Berkeley**
- **University of California at Los Angeles**
- **University of Maryland**
- **University of Michigan**
- **University of North Carolina - Chapel Hill**
- **University of Texas**
- **University of Wisconsin**
- **Vanderbilt University**



## 5 Fields of Study

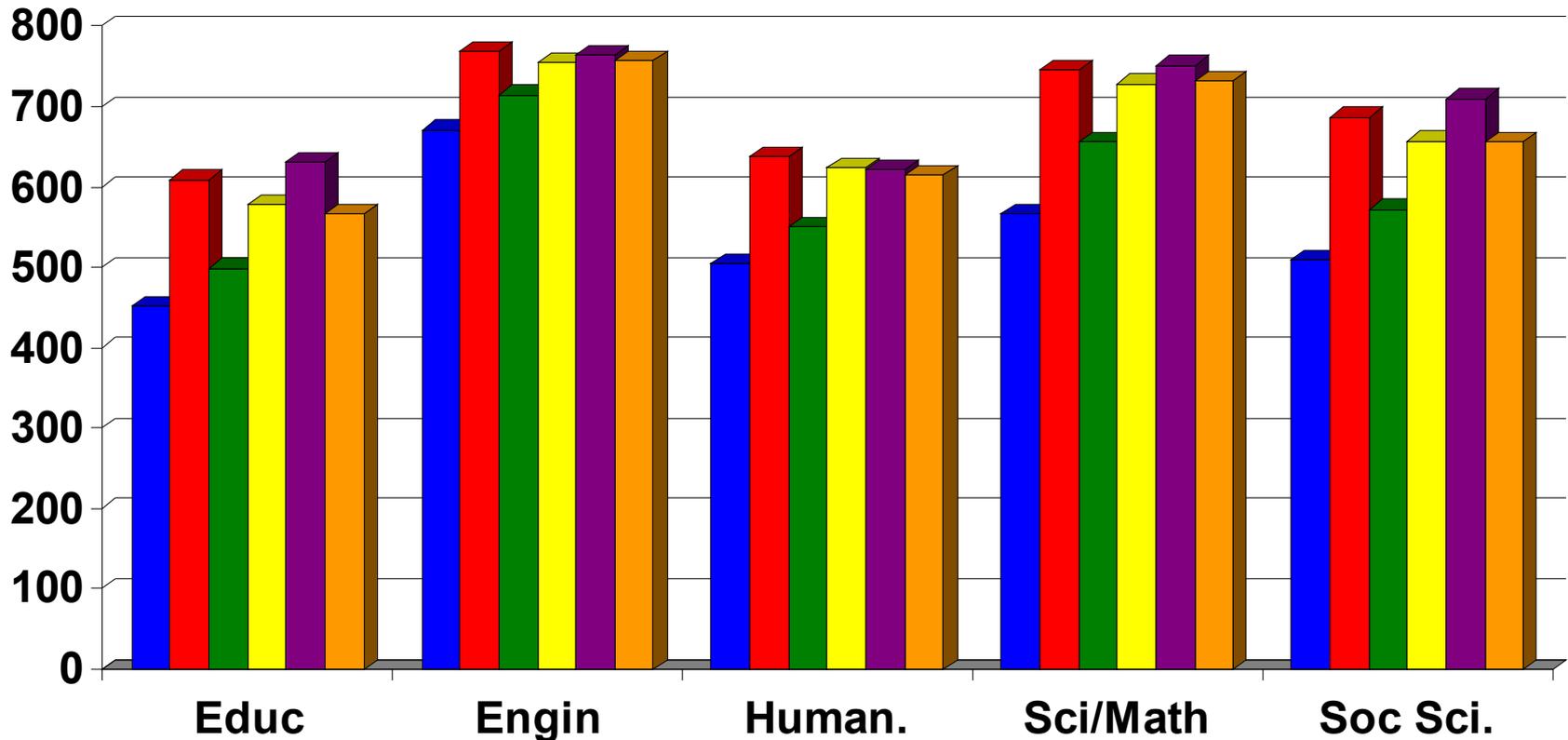
- Science & Math - biology, chemistry, physics, math
- Social Sciences - economics, political science, psychology, sociology
- Humanities - English, history
- Education
- Engineering - chemical, electrical, mechanical

# GRE Verbal Scores by Race and Field



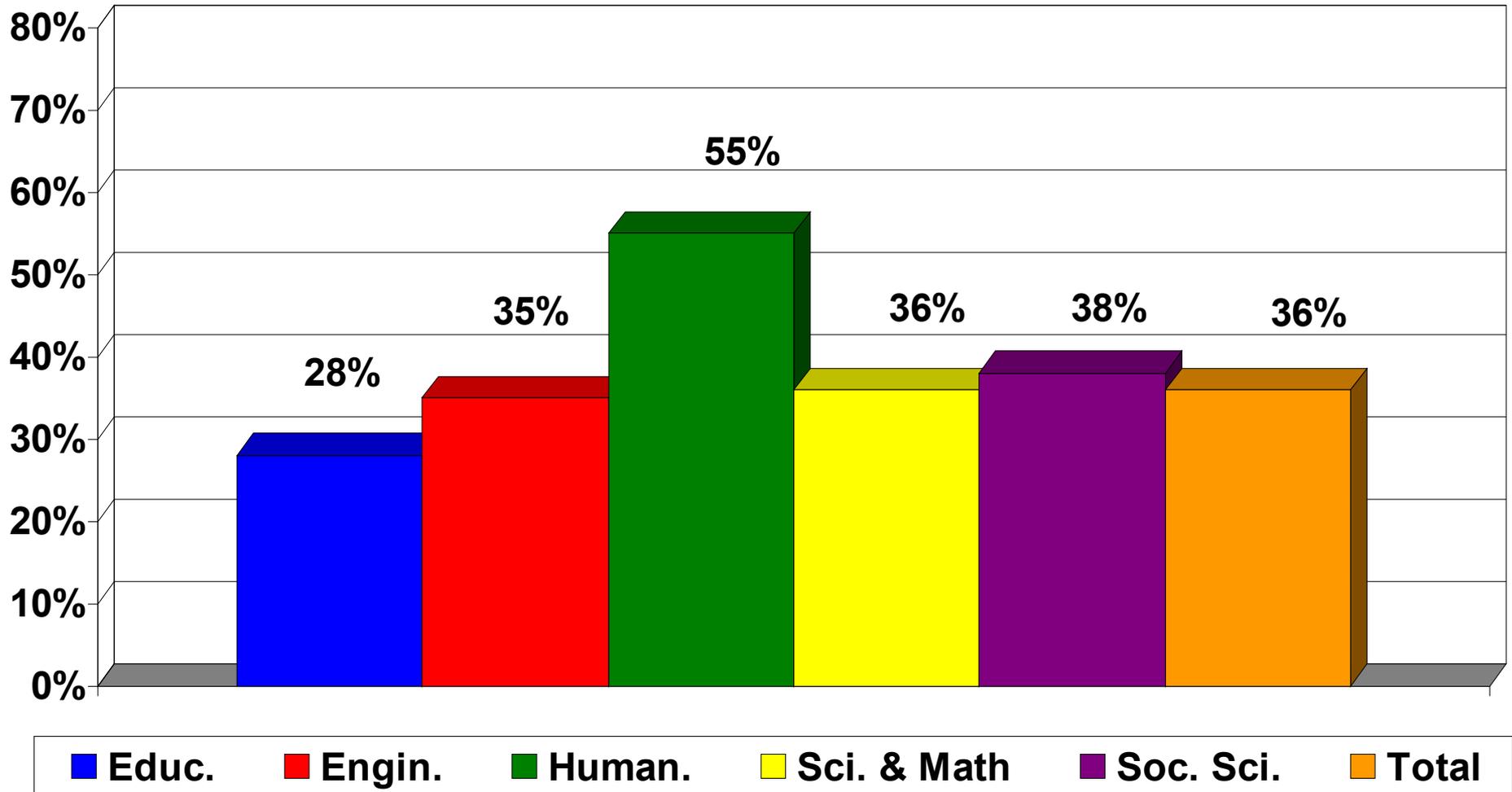
■ Afr. Amer.    ■ Asian    ■ Hisp.    ■ White    ■ Inter.    ■ Total

# GRE Quantitative Scores by Race and Field

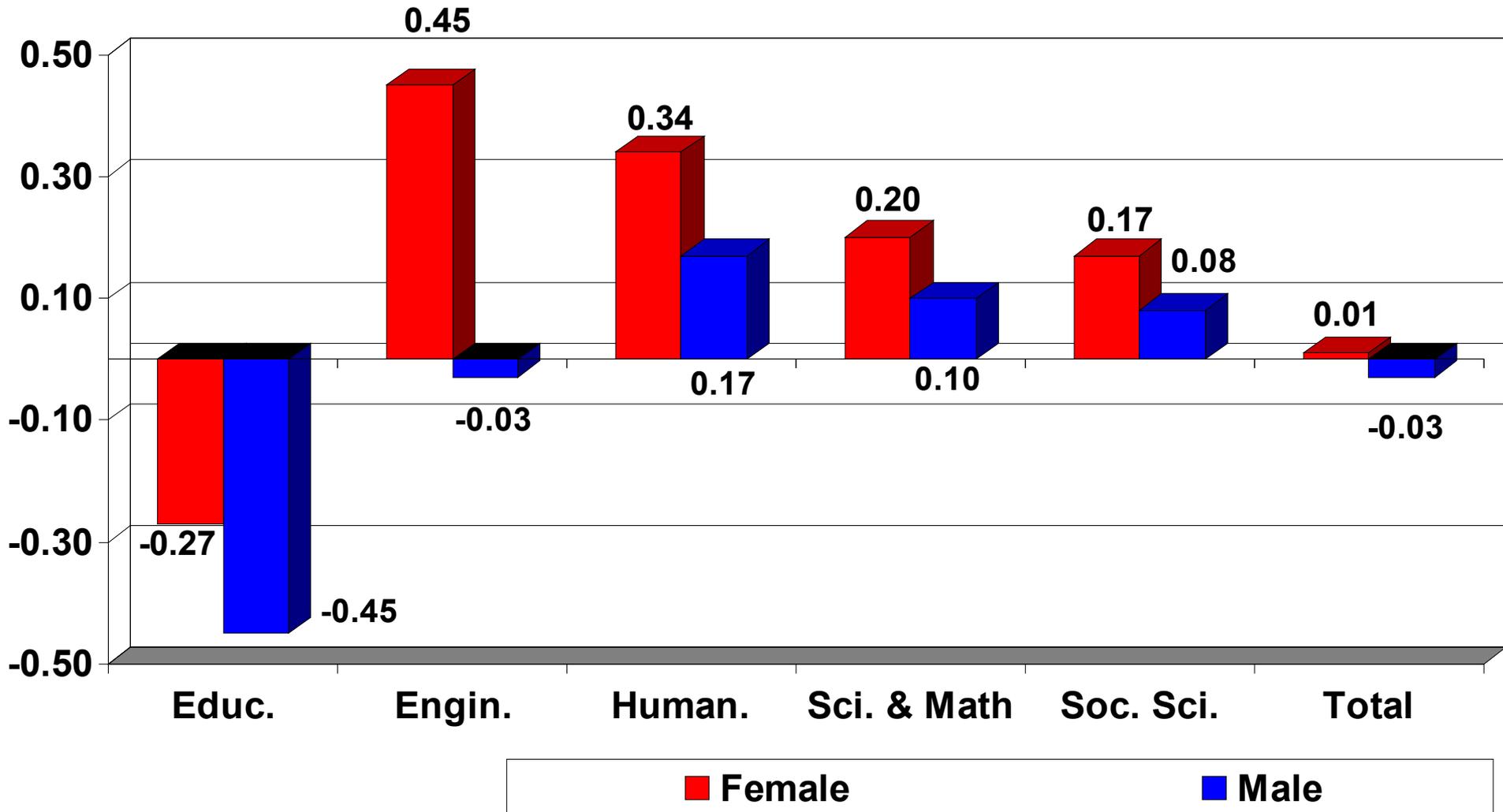


■ Afr. Amer.    ■ Asian    ■ Hisp.    ■ White    ■ Inter.    ■ Total

# Has BA from a Highly Selective C&U



# Parents' Social Class: Education and Income Composite





# Doctoral Student Funding

- Fellowships
- Teaching Assistantships
- Research Assistantships
- Loans



# Research Assistantship Influences

## Ever Research Assistant

### Influences \*

- Acquiring debt during program
- Ever receiving a fellowship
- Ever being a teaching assistant
- Social interaction with peers
- Academic interactions with faculty
- Interactions with faculty advisor
- Presenting a paper at a conference
- Publishing an article
- Overall research productivity
- Stopping out of a doctoral program
- Rate of progress in program
- Degree completion

## No Influences

- Student – faculty social interactions
- Satisfaction with doctoral program
- Time to Degree

\* Note: Influences may not be in all



# Research Assistantship Influences – Sci & Math

## Ever Research Assistant

### Influences \*

- Acquiring debt during program
- Ever receiving a fellowship
- Ever being a teaching assistant
- Social interaction with peers
- Academic interactions with faculty
- Interactions with faculty advisor
- Presenting a paper at a conference
- Publishing an article
- Overall research productivity
- Stopping out of a doctoral program
- Rate of progress in program
- Degree completion

## No Influences

- Student – faculty social interactions
- Satisfaction with doctoral program
- Time to Degree

\* Note: Influences may not be in all



# Research Assistantship Influences Engineering

## Ever Research Assistant

### Influences \*

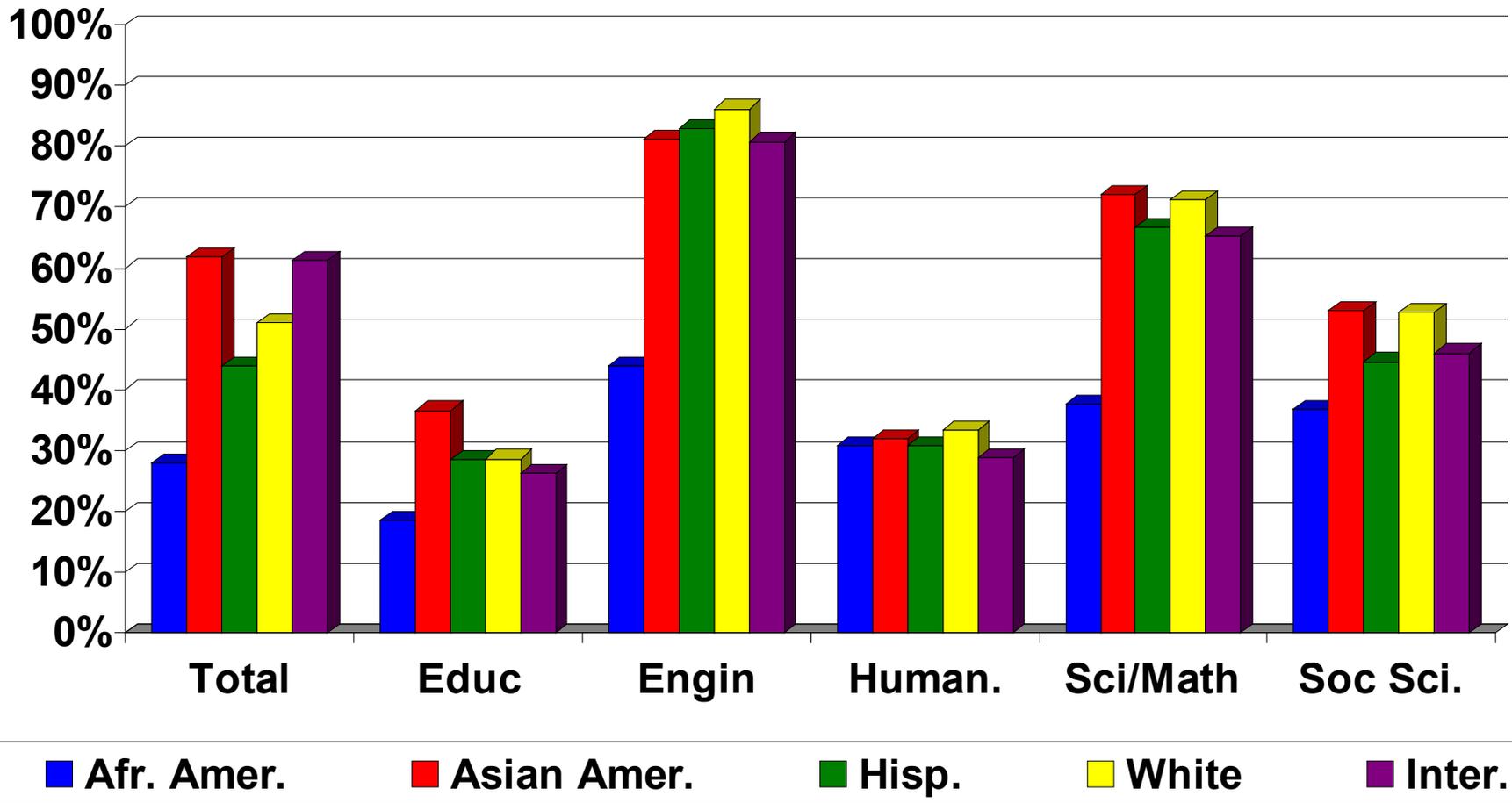
- Acquiring debt during program
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## No Influences

- Student – faculty social interactions
- Satisfaction with doctoral program
- Time to Degree

\* Note: Influences may not be in all

# Ever Received a Research Assistantship During Doctoral Program by Race and Field



African Americans ever having a research assistantship is significantly different from Whites overall but is not significantly different from Whites in each field.

Source: Nettles & Millett, Understanding for Improvement



# Interpreting Odds Ratios

- **Positive number = more likely**
- **Equal to 1 = equally likely (no difference)**
- **Negative number = less likely**

# Being a Research Assistant (RA) Over Course of Doctoral Study- Selected Odds Ratio Estimates

	Educ.	Engin.	Human.	Science/ Math	Social Science
Male	-1.24	-1.00	-1.11	-1.03	<b>-1.28*</b>
African-American	<b>-2.18***</b>	<b>-4.45***</b>	-1.15	<b>-3.42***</b>	-1.35
Hispanic-American	<b>-1.73*</b>	-1.05	-1.60	1.05	-1.30
Asian-American	1.03	1.49	-1.38	1.06	-1.09
International	<b>-1.85**</b>	<b>-1.68**</b>	-1.47	-1.17	<b>-1.37*</b>
Age at start of prog	<b>-1.05***</b>	<b>-1.05*</b>	-1.03	<b>-1.06***</b>	<b>-1.04**</b>
Ever had Fellowship	<b>2.35***</b>	<b>-2.20***</b>	<b>2.26***</b>	<b>-1.96***</b>	1.12
Ever Teaching Assit	<b>1.85***</b>	1.29	<b>1.75*</b>	<b>1.28*</b>	<b>1.96***</b>
Private grad school	<b>-1.90***</b>	1.26	1.03	-1.24	<b>-1.55***</b>
Time in program	<b>1.06**</b>	<b>1.14**</b>	1.04	<b>1.30***</b>	<b>1.09**</b>
First job fac./postdoc	1.10	-1.24	1.14	<b>-1.26*</b>	<b>1.34*</b>

\*p<.05; \*\*p<.01; \*\*\* p< .001.

Negative signs = inverse odds ratios & denote less likely to have been an RA.

## Mentoring

“Mentors, unlike advisors, cannot be assigned to specific students. Advisors may be mentors, but many advisor-advisee relationships never evolve to the mentor-protégé relationship”  
(Willie, Grady & Hope, 1991, p. 72)



## Faculty Advisor (B-6)

- A faculty or research advisor is a person assigned by your department/program to act in an official capacity in such ways as discussing and approving your coursework, or signing registration forms. Please note that your faculty or research advisor may not be your mentor. Do you have a faculty member who serves as your advisor?

\_\_\_\_\_ 1. Yes

\_\_\_\_\_ 2. No (If 'NO,' **GO TO B-9**)



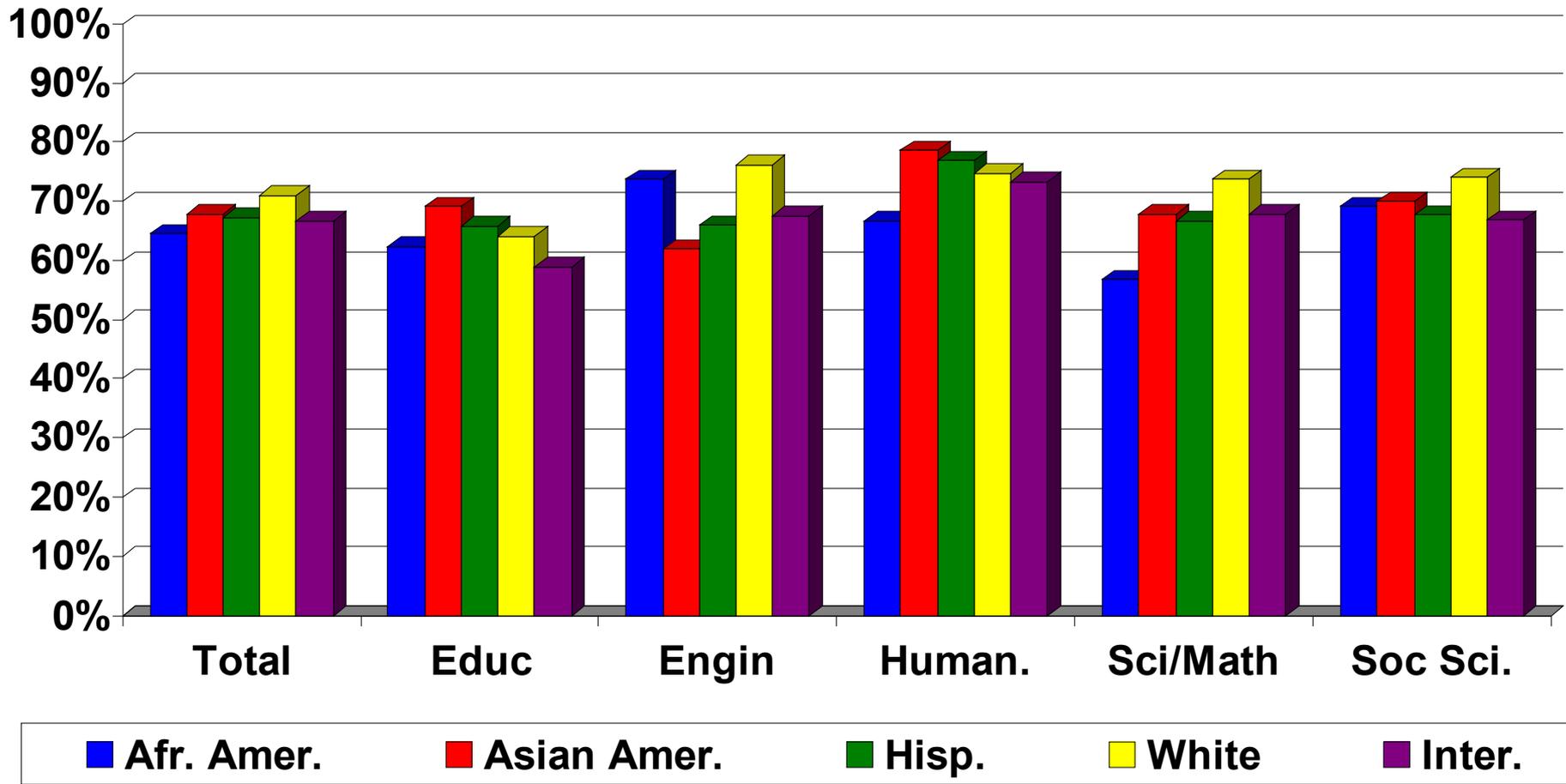
## Mentor Question (B-9)

- Many doctoral students have someone on the faculty to whom they turn for advice, to review a paper, or for general support and encouragement. This person may be thought of as a mentor. If you have more than one mentor, please comment on the one with whom you work most closely. Do you have a faculty member who serves as your mentor?

\_\_\_\_\_ 1. Yes

\_\_\_\_\_ 2. No (If 'NO,' **GO TO B-13**)

# Has a Faculty Mentor by Race and Field



African American having a faculty mentor is significantly different from Whites overall but is not significantly different from Whites in each field.

Source: Nettles & Millett, Understanding for Improvement

# Faculty Mentoring Influences

## Have a Faculty Mentor

## Influences \*

- Student-faculty social interactions
- Academic interaction with faculty
- Interactions with faculty advisor
- Presenting a paper at a conference
- Publishing an article
- Overall research productivity
- Rate of progress in program
- Degree completion
- Time to Degree

## No Influences

- Satisfaction with doctoral program
- Stopping out of doctoral program

\* Note: Influences may not be in all fields

# Have a Faculty Mentor

## Selected Odds Ratio Estimates

	Educ.	Engin.	Human.	Science/ Math	Social Science
Male	1.03	1.18	-1.52*	-1.21	-1.24
African-American	-1.21	-1.24	-1.48	-2.55**	-1.06
Hispanic-American	1.37	-1.39	1.16	-1.76	-1.24
Asian-American	1.25	-2.07***	1.21	-1.24	-1.21
International	-1.50*	-1.58**	1.01	-1.10	-1.17
Parents' SES	1.11	1.22**	1.06	1.16**	1.17*
GRE Verbal (100 pt)	-1.03	-1.12*	-1.15	1.09	1.01
GRE Quant (100 pt)	1.04	1.00	1.15	-1.30**	1.02
Private grad school	-1.23*	1.21	-1.37	-1.27*	-1.26

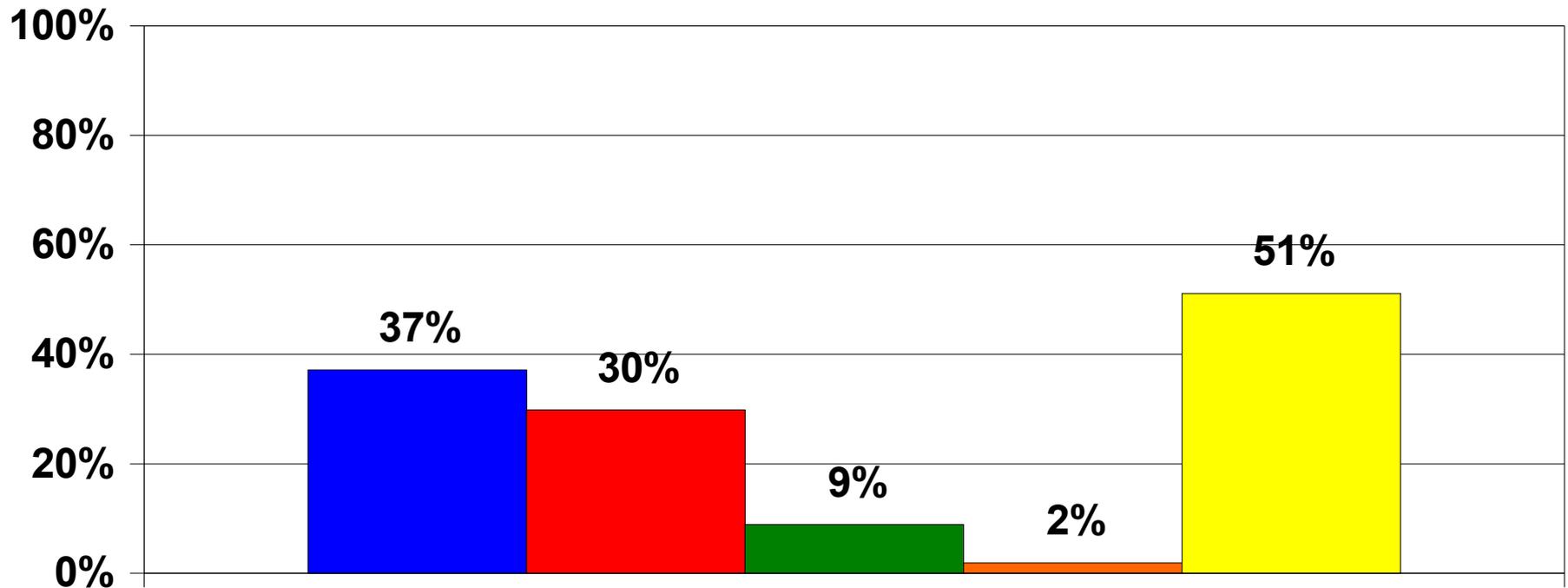
\*p<.05; \*\*p<.01; \*\*\* p< .001.

Negative signs = inverse odds ratios & denote less likely to have a mentor



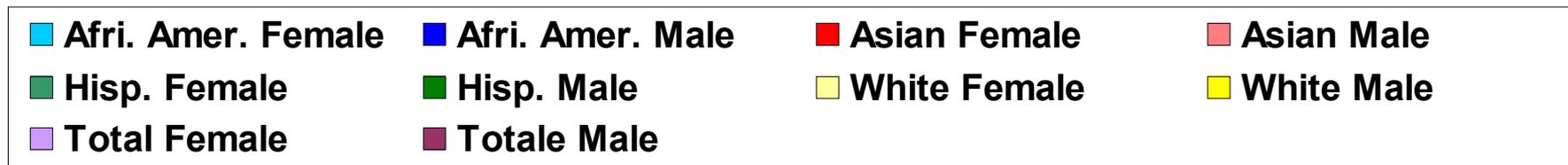
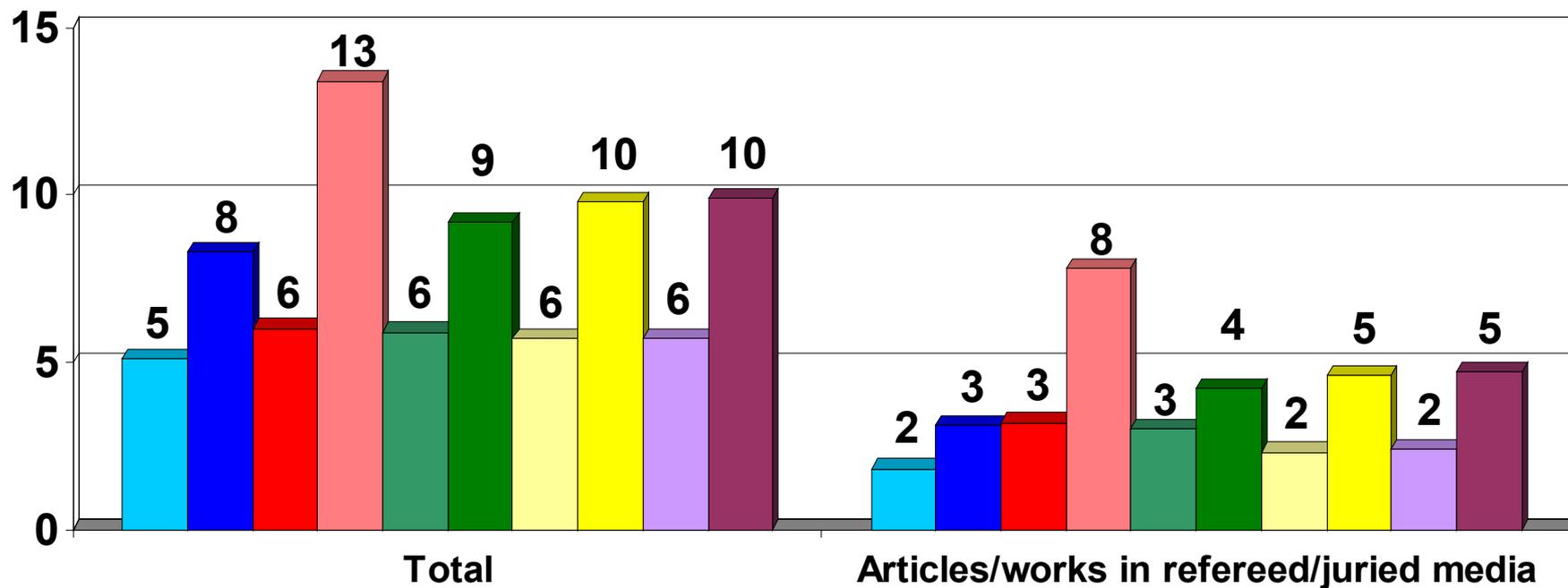
# Research Productivity

# Doctoral Student Research Productivity by Type



- Presented a paper
- Published a Refereed Journal Article
- Published a Chapter in an Edited Volume
- Published a Book
- Some Research Productivity

# NSOPF: Number of Scholarly Works Among Full-Time Instructional Faculty & Staff by Race/Ethnicity & Gender Fall 1998



Source: NCES Report: 2002-170, Table 13



# Research Productivity Influences

## Research Productivity

## Influences \*

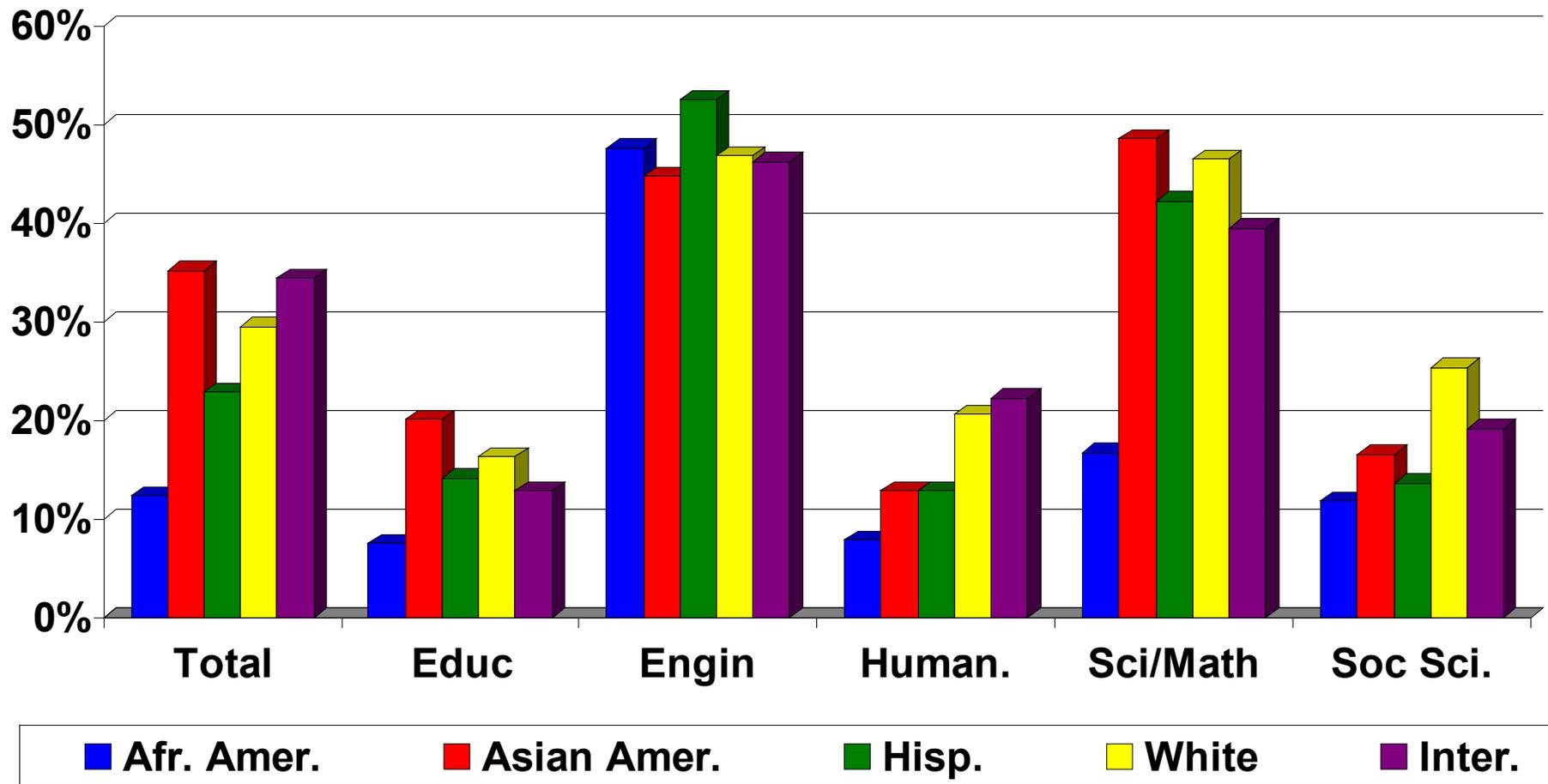
- Rate of progress in program
- Degree completion

## No Influences

- Time to Degree

\* Note: Influences may not be in all fields

# Published a Research Article in a Refereed Journal by Race and Field



African Americans publishing an article are significantly different from Whites in the total, but African Americans are not significantly different from Whites within each of the 5 fields.

Source: Nettles & Millett, Understanding for Improvement

# Published an Article – Refereed Journal

## Selected Odds Ratio Estimates

	Educ.	Engin.	Human.	Science/ Math	Social Science
Male	1.12	1.63**	1.40	1.34**	-1.00
African-American	-2.16**	1.16	-2.64	-3.24**	-2.30**
Hispanic-American	1.29	1.46	-1.58	-1.26	-2.15*
Asian-American	-1.25	-1.20	1.52	-1.00	-1.83
International	-1.31	-1.04	1.04	-1.12	-1.37
Private grad. school	-1.46**	1.16	-1.35	1.25*	1.05
Research assistant	1.74***	1.58**	1.28	2.81***	1.67***
Teaching assistant	1.34*	1.01	1.90*	-1.48***	1.02
Has a mentor	1.52**	1.35*	1.41	1.31*	2.05***
Time in program	1.07***	1.31***	1.13***	1.42***	1.12***
First job fac./postdoc	1.42**	1.22	1.33	1.14	1.57**

\*p<.05; \*\*p<.01; \*\*\* p< .001.

Negative signs = inverse odds ratios & denote less likely to have published.



# A Graduate School's Spheres of Influence

- Student Funding Options:
  - Type of funding
  - Timing of funding
- Mentoring:
  - Make mentoring attractive to both students and faculty
  - The level of engagement of both parties may be important
- Research Productivity
  - Develop mechanisms for students to acquire productivity



# Policy Evaluation & Research Center

<http://www.ets.org/research/pre.html>



## Doctoral Facts

- Approximately 1.2% of the U.S. adult population age 25 and over has a doctoral degree.
- The United States produces approximately 45,000 doctoral degree recipients each year.
  - In some fields, very few degrees are awarded annually and particularly to members of under-represented groups.
  - Nineteen African Americans earned doctorates in mathematics in 2001.

# Has Faculty Mentor

