

Casey W. Miller

Director, APS-BP@USF
Department of Physics
University of South Florida



From ETS Guide to Use of Scores: “Any GRE test, however, has two primary limitations:

It is an inexact measure; **only score differences that exceed the standard error of measurement of a given score can serve as a reliable indication of real differences** in applicants' academic knowledge and developed abilities.”

Translated to physics-ese:

CONSIDER INSTRUMENT RESOLUTION

S.E.M. ~60 points (on old GRE scale, 200-800).

740 = 800 = perfect!

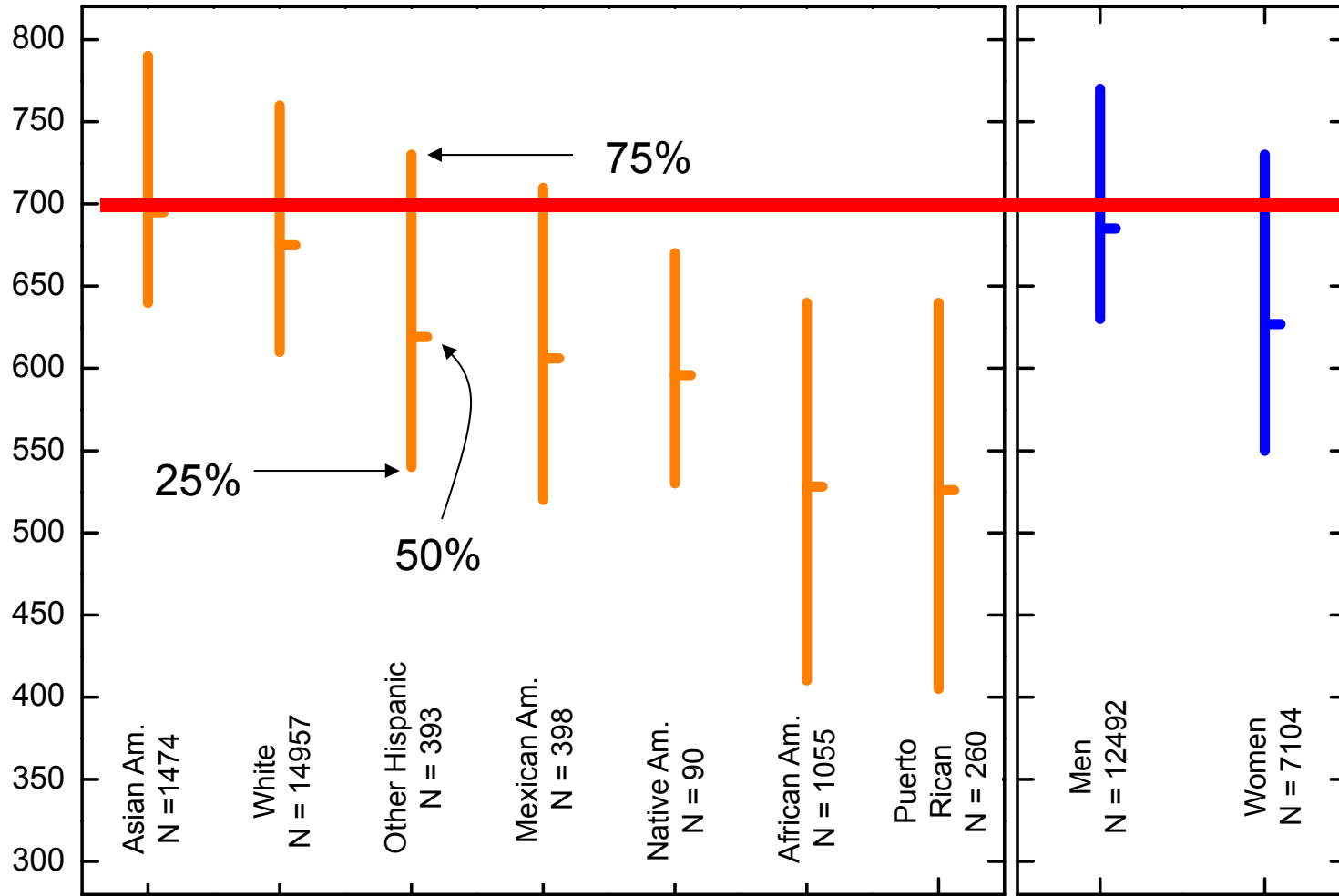
Numerous departments report their average score for admission as 790, 800

Median of average GRE-Q scores Physics Depts reported to NRC: 760

From ETS document

"Factors that can influence performance on the GRE general test 2006-2007"

GRE Quantitative Scores (2006-2007)
Physical Sciences, US Citizens



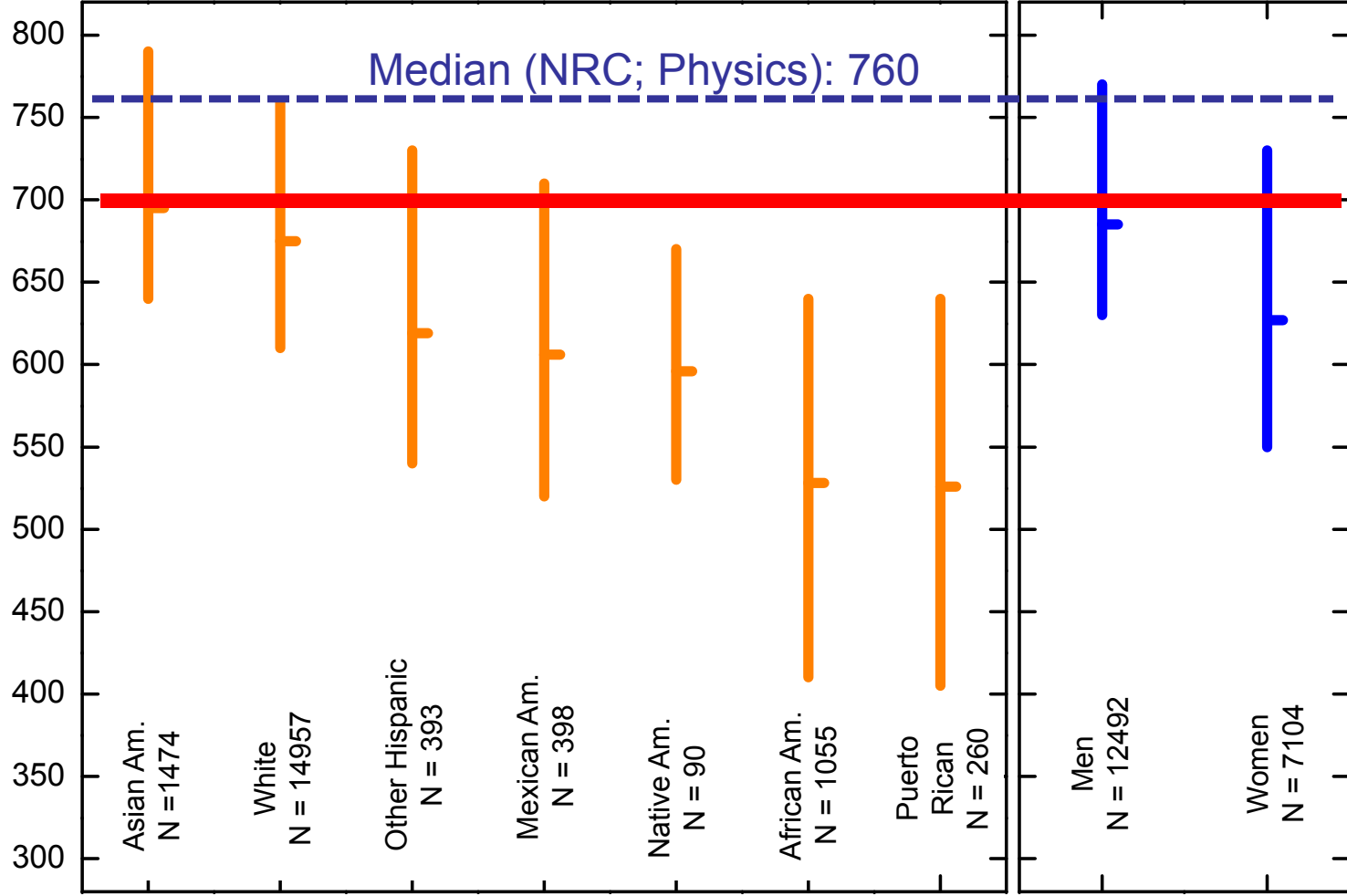
These trends are:

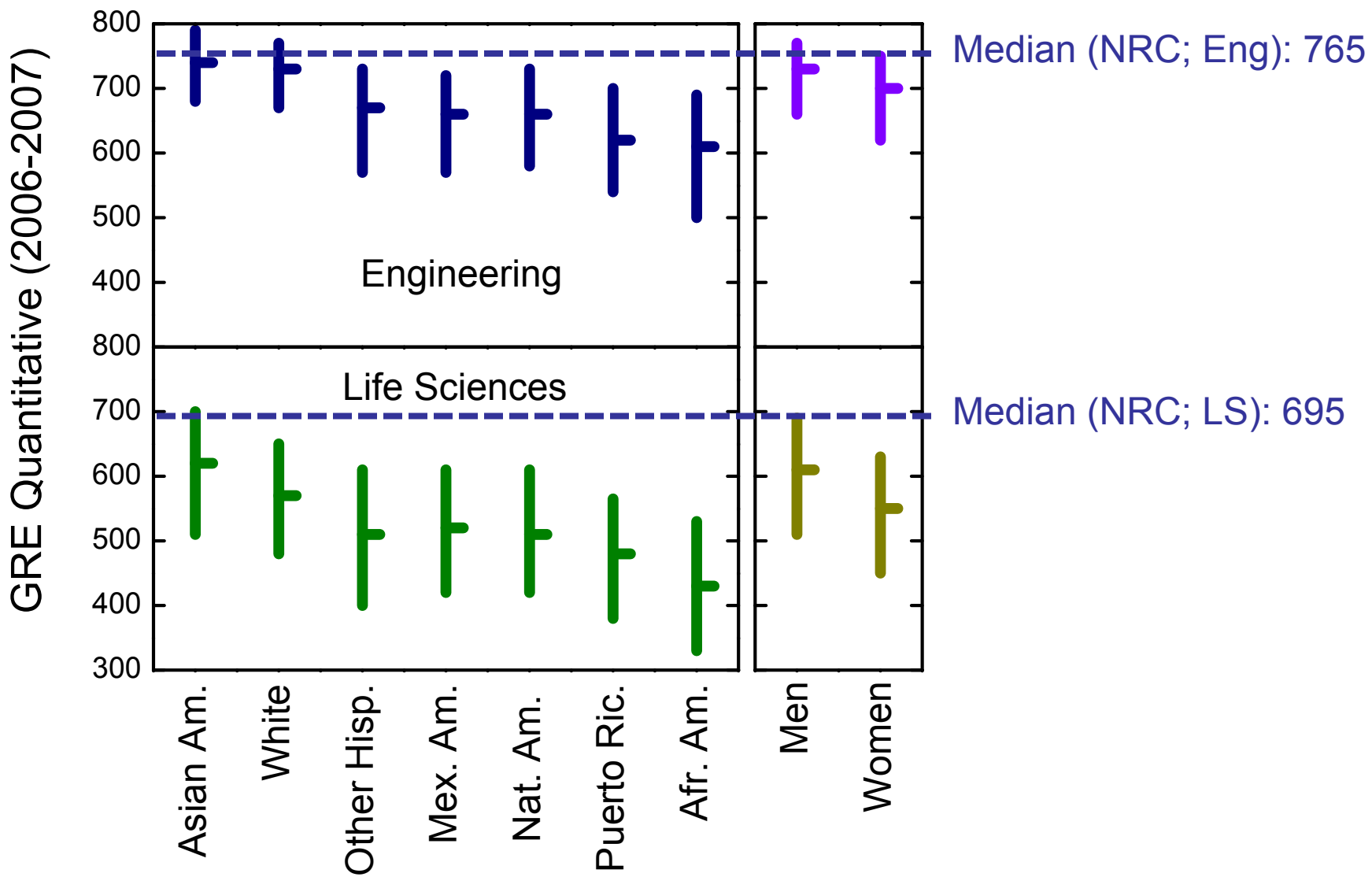
- technically not “bias”
- qualitatively unchanged when controlling for undergraduate GPA
- qualitatively the same for the SAT
- reflected in race-based passing levels set by FL and VA for grade schoolers
- a feature of standardized testing?

Compiled from ETS document

"Factors that can influence performance on the GRE general test 2006-2007"

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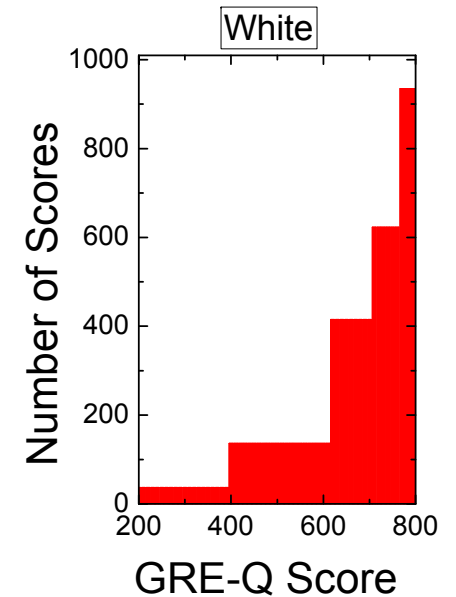




Compiled from ETS document
 "Factors that can influence performance on the GRE general test 2006-2007"

Impact of Cut-off Scores?

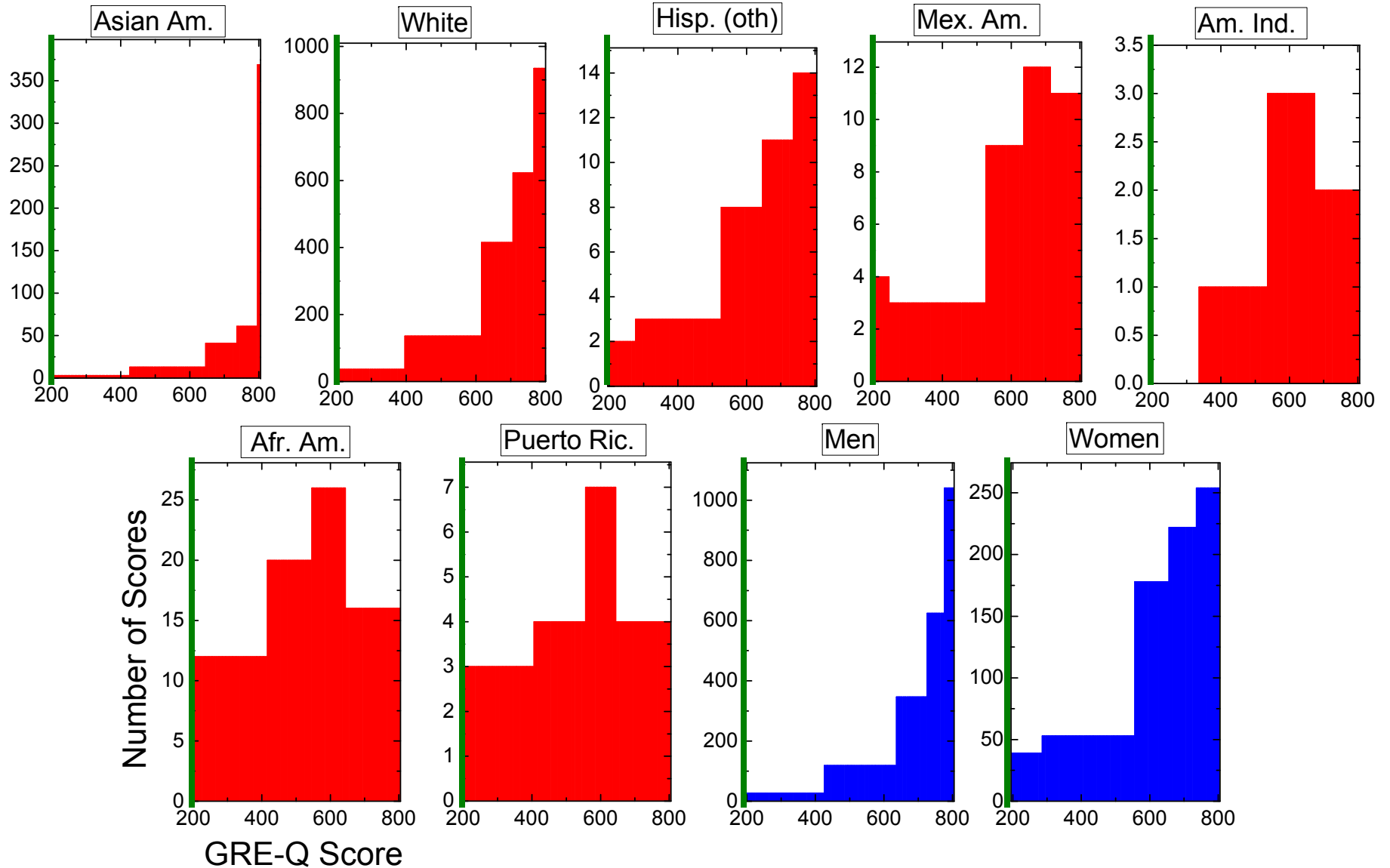
- Make approximate score distributions from the ETS data
 - 25th, 50th, 75th, and sometimes 5th%
 - assume flat distribution between %'s
 - e.g., N/4 scores between 25th and 50th
- Quantify (roughly) the impact of cut-off scores on representation



Representation

$$\frac{\sum_{\text{Cut-off}}^{800} \text{one group}}{\sum_{\text{Cut-off}}^{800} \text{all groups}}$$

Approximate Score Distributions



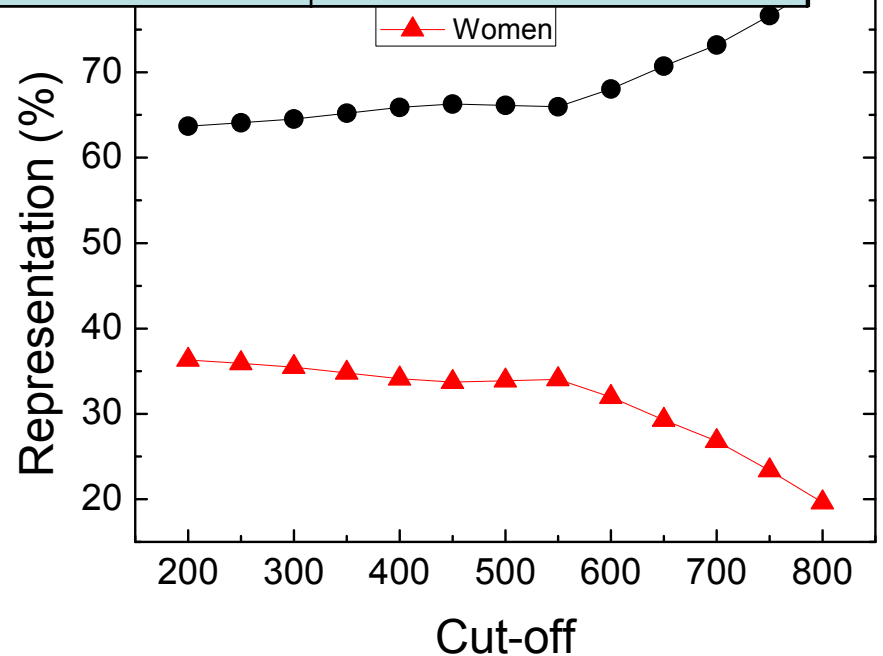
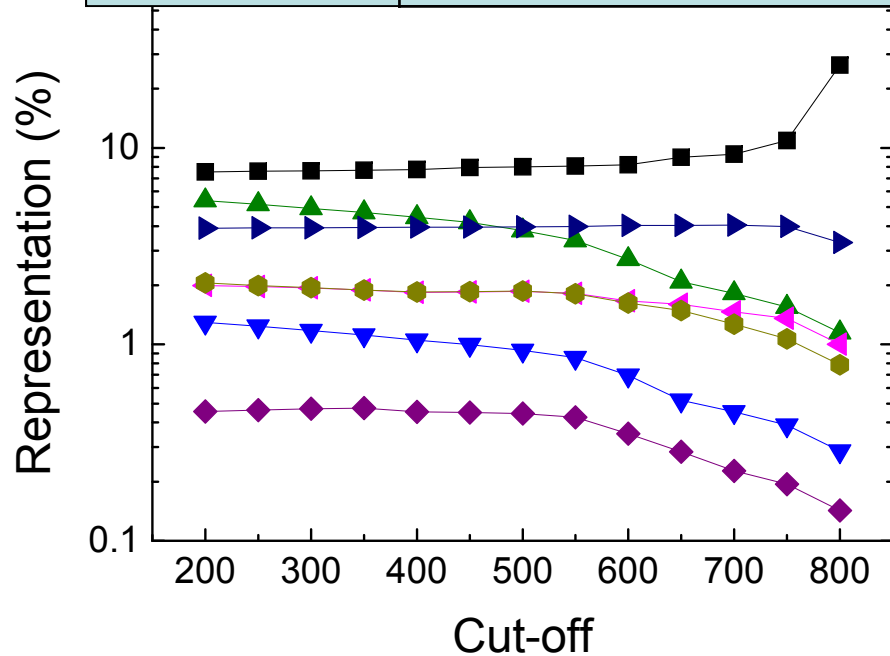
Only physical sciences & US citiz.

Impact of Cut-offs: Representation

Representation

$$\frac{\sum_{\text{Cut-off}}^{800} \text{one group}}{800}$$

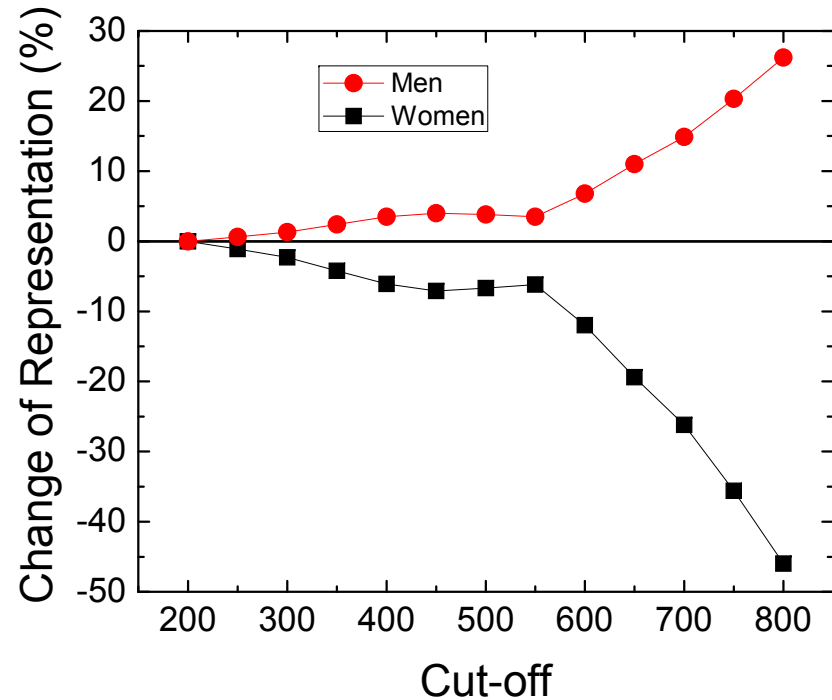
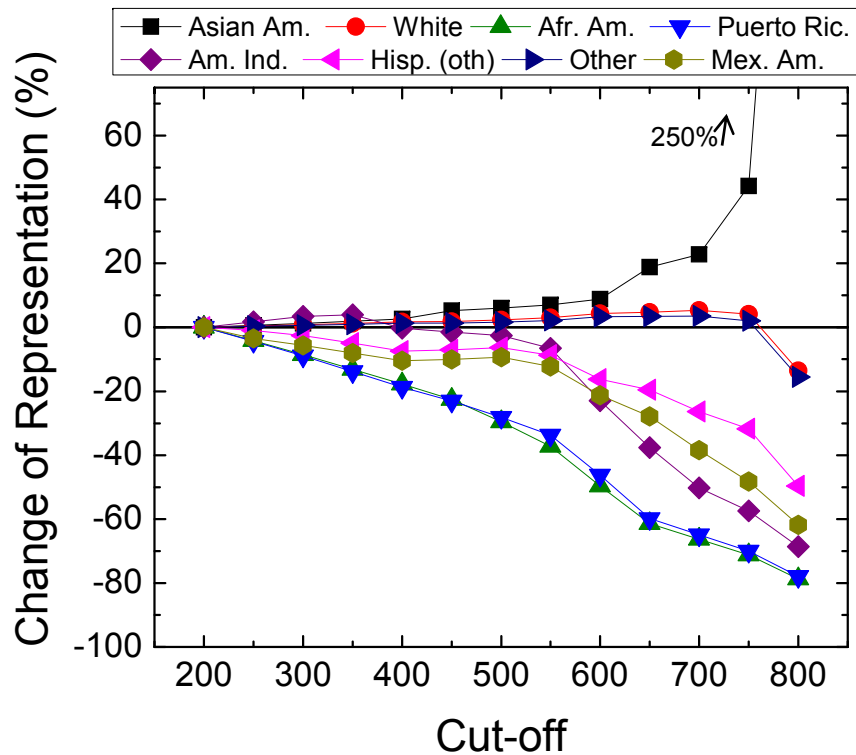
Cut-off	Asian Am.	White	URMs	Women	Men
700	9.3%	81.5%	5.2%	26.8%	73.2%
Test Takers	Asian Am.	White	URMs	Women	Men
	7.6%	77.4%	11.2%	36.3%	63.7%

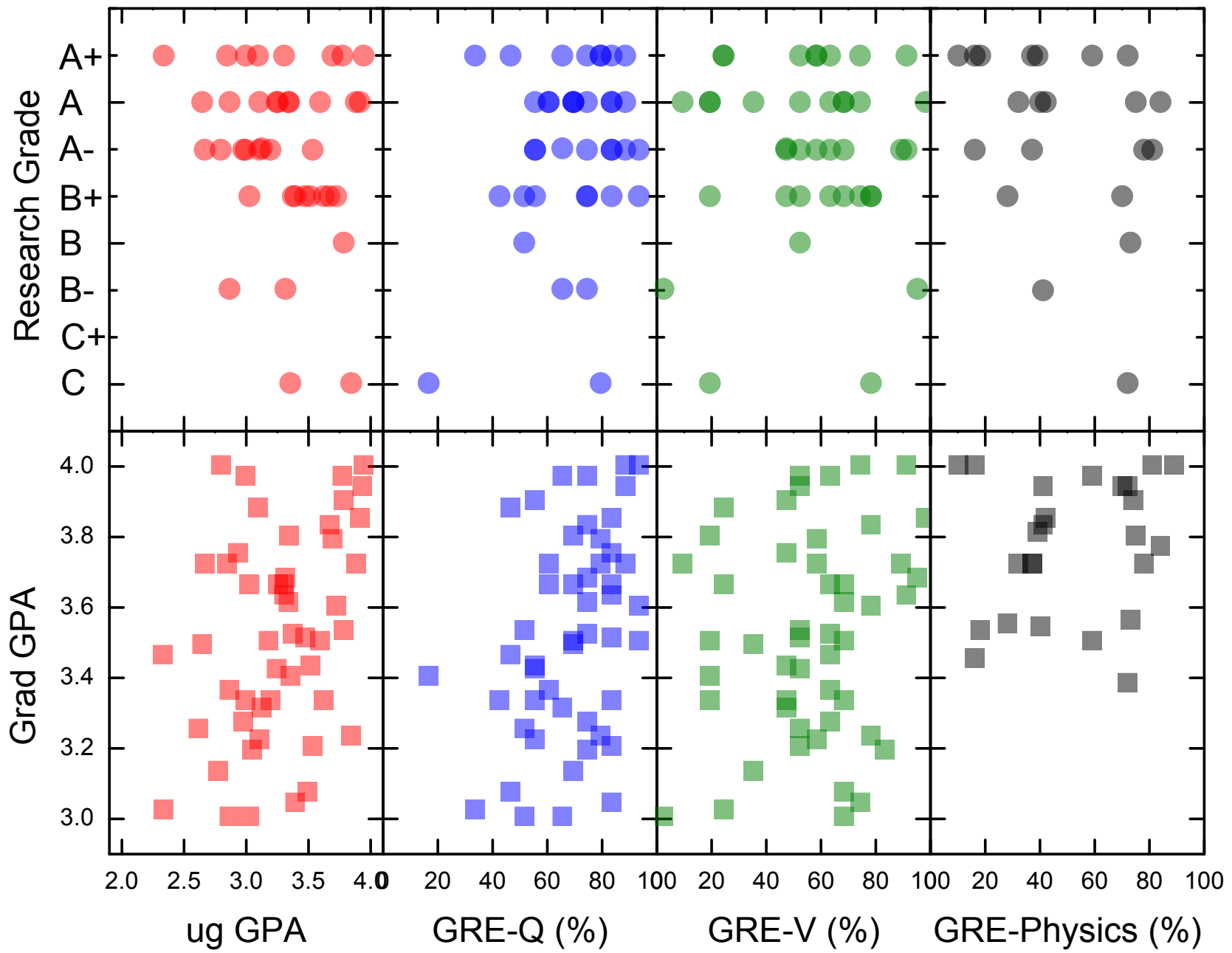


Impact of Cut-offs: %Δ Representation

Representation

$$\frac{\sum_{\text{Cut-off}}^{800} \text{one group}}{\sum_{\text{Cut-off}}^{800} \text{all groups}}$$





Ideas we are trying out: Coarse-Grained Rubrics:

- Undergrad GPA
 - Trends in physics
- Undergrad Institution
- GRE scores
 - if relevant for predicting in your program
- Personal Statement
 - targeted topics?
- Recommendation Letters
 - assign letter grades
- **Call them!**

American Journal of Physics -- April 2011 -- Volume 79, Issue 4, pp. 374

The Fisk-Vanderbilt Master's-to-Ph.D. Bridge Program: Recognizing, enlisting, and cultivating unrealized or unrecognized potential in underrepresented minority students

Keivan G. Stassun¹, Susan Sturm², Kelly Holley-Bockelmann¹, Arnold Burger³, David J. Ernst¹, and Donna Webb⁴

A great resource: interview protocols and score sheet ideas

Victoroff and Boyatzis, J. Dent. Ed 77, 416 (2013):

Correlating clinical performance to admissions criteria and noncognitive competencies

Provides empirical support (consistent with prior work) for correlations:

- (a) YES: cognitive ability and didactic performance
- (b) NO: cognitive ability and clinical performance
- (c) **YES: non-cognitive competencies and clinical performance**
- (d) Yes&No: non-cognitive competencies and didactic performance

Self-Management competencies correlate with clinical grade.

1. **Achievement Orientation:** Striving to improve, or meet a standard of excellence.
2. **Initiative:** Readiness to act on opportunities.
3. **Optimism:** Persistence in pursuing goals despite obstacles and setbacks.
4. **Adaptability:** Flexibility in handling change.
5. **Emotional Self-Control:** Keeping disruptive emotions and impulses in check.
6. **Trustworthiness:** Maintaining integrity.
7. **Conscientiousness:** Taking responsibility for personal performance.

“Cognitive ability and knowledge are threshold aspects of professional work, necessary but not sufficient for outstanding professional performance.”

Victoroff and Boyatzis, J. Dent. Ed 77, 416 (2013):

Correlating clinical performance to admissions criteria and noncognitive competencies

Provides empirical support (consistent with prior work) for correlation between admissions criteria and clinical performance

- (a) YES: cognitive ability and didactic performance
- (b) NO: cognitive ability and clinical performance
- (c) **YES: non-cognitive competencies** and clinical performance
- (d) Yes&No: non-cognitive competencies and clinical performance

These are measurable, and reportedly lack racial, gender, cultural, language performance differences

Self-Management competencies correlated with clinical grade.

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“Cognitive ability and knowledge are threshold aspects of professional work, necessary but not sufficient for outstanding professional performance.”

Conclusions

Inappropriate use of GRE scores can have (has had??) a significant, unintended, adverse impact on diversity

Representation Ceiling?					
Cut-off	Asian Am.	White	URMs	Women	Men
700	9.3%	81.5%	5.2%	26.8%	73.2%
			6%	20%	

Programs should consider:

- developing safeguards against giving GRE scores undue weight,
- justifying present GRE usage: for you, does it predict success in research (the aim of the PhD)?