



Insights from Analyses of NIH Administrative Data on Peer Review Outcome Disparities

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Della Hann, PhD, and
Robin Wagner, PhD, MS

Office of Planning, Analysis and Communications (OPAC)
Office of Extramural Research, NIH



National Institutes of Health
Office of Extramural Research

Acknowledgments

Research Team

- Matthew Eblen, MPIA*
- Katherine Catevenis, MSPH
- Susan Ivey, MA
- Katrina Pearson
- Lindsay Pool, MPH*
- Deepshikha Roychowdhury, PhD*
- Robin Wagner, PhD, MS
- Charles Wu, MPH

*Lead Analysts

Consultants and Feedback

- Sally Amero, PhD
- George Chacko, PhD
- Della Hann, PhD
- Richard Ikeda, PhD
- Jim Onken, PhD, MPH
- NIH Committees/Workgroups
 - Extramural Activities Working Group
 - Extramural Programs Management Committee
 - Program Leadership Committee
 - Peer Review Oversight Committee
 - Review Policy Committee
 - Policy and Evaluation Interest Groups
 - NIH Advisory Committees
- *Rock Talk* Blog comments



Division of Statistical Analysis and Reporting OER



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Overview of Presentation

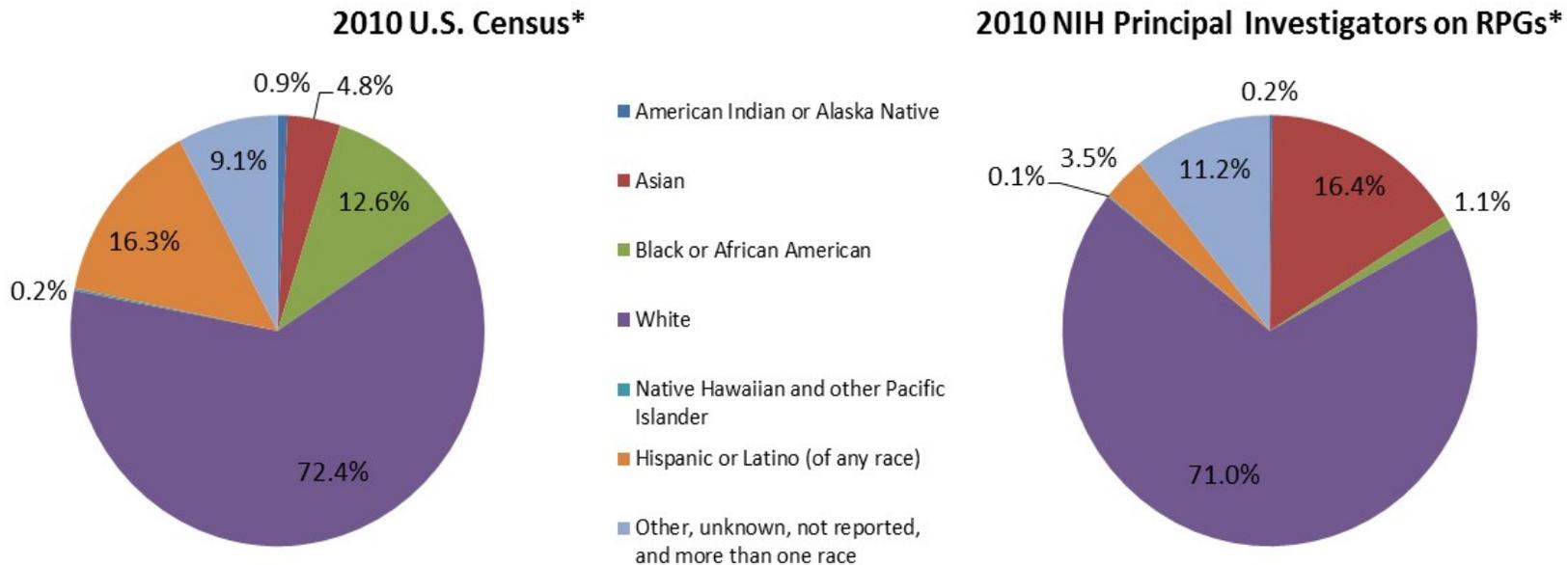
- Race and Ethnicity of U.S. Population and NIH Principal Investigators in 2010
- Overall Conclusions: What Do These Analyses Tell Us?
- Analysis Highlights*
 - Grant Outcomes by Fields of Science and Race
 - Grant Outcomes by Race of Peer Reviewers and Applicants
 - Resubmission Behaviors of Unsuccessful, Unsolicited R01 Grant Applicants
 - How Criterion Scores Influence the Overall Impact Score and Funding Outcomes for NIH Peer-Reviewed Applications
- Summary

*Analyses excluded applications funded under the American Recovery and Reinvestment Act (ARRA)



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Race and Ethnicity of U.S. Population and NIH Principal Investigators in 2010



2010 U.S. Census Bureau Report, <http://2010.census.gov/2010census/data/2010> (left)

NIH Principal Investigators on Research Project Grants (RPGs), NIH IMPAC II (right)

*Total percentage is over 100 because those identified as Hispanic/Latino may also have identified as other races. PI information collected by NIH includes the option for an applicant to signify both race and ethnicity.



What Do these Analyses Tell Us? – I

- Differences in fields of science do not explain the disparities in success rates of African American Principal Investigators (PIs)
- Racial composition of Scientific Review Groups (SRGs) is likely to have a minimal effect on the discussion or success rates of applications from different race groups
- Resubmission of unsolicited, unsuccessful R01 grant applications is largely determined by the Priority/Overall Impact Score and type (new or renewal) of the A0 (initial) application, rather than race or other factors evaluated
 - Differences in distribution of A0 scores by race are associated with African Americans resubmitting less often than other race groups
- PIs who are underrepresented minorities (URM) or whose parents have lower educational attainment are associated with poorer peer review outcomes



What Do these Analyses Tell Us? – II

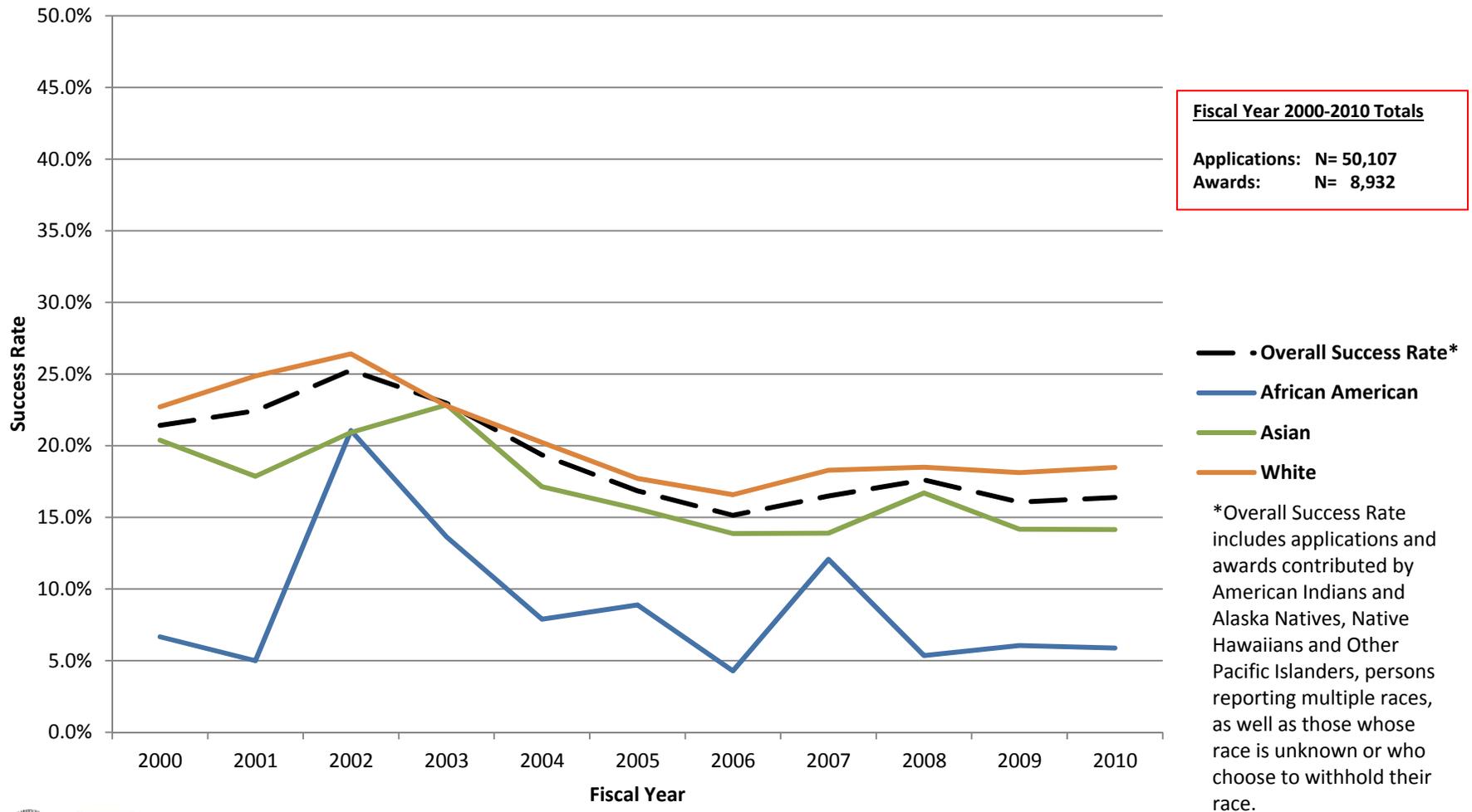
- Criterion scores are the most important predictors of peer review outcomes, with race and other factors diminishing in effect or becoming insignificant after controlling for criterion scores
- Amongst all factors evaluated, the *Approach* criterion score is by far the *most important* determinant of applicant resubmission actions, and peer review and funding outcomes
 - Strategies successful at improving Approach scores will have the greatest influence on chain of events that lead to funding applicants
- While the Resubmission, Impact and Funding models can describe any residual effects of race after controlling for criterion scores and all other measured variables, they cannot explain why the score distributions differ by race



Success Rates by Field of Science and Race

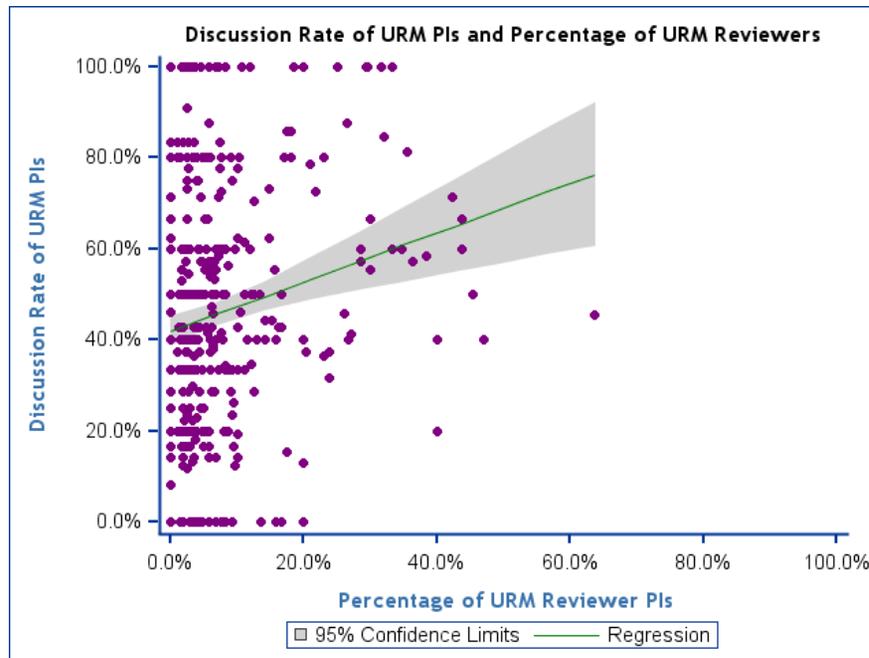
What are the Success Rate Trends in **Basic Sciences** by Race?

Type 1 RPG Applications
Fiscal Years 2000-2010



Discussion Rates of URM Applications by Percentage of URM Reviewers

Limited to review group meetings with at least 5 research applications from URMs : 395 out of 8,921 meetings (4.4%)

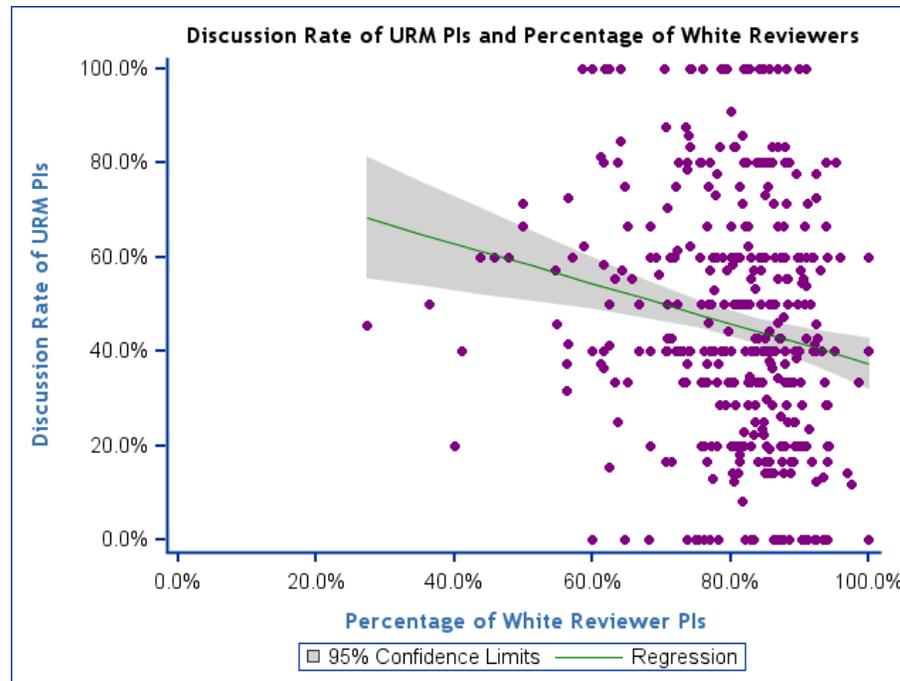


- The greater the % of URM reviewers, the greater the discussion rate of URM applications – statistically significant.
- However, the relationship was weak (low correlation).
- The amount of variation in discussion rates explained by the % of URM reviewers was low – only 3.7%.
- **Conclusion:** The % of URM reviewers has very little influence on the discussion rates of URM applications. To increase the % of URM reviewers would be difficult because the pool is small; even for these study sections reviewing more URM applications, most of them had < 20% URM reviewers.



Discussion Rates and Success Rates of URM Applications by Percentage of White Reviewers

Limited to review group meetings with at least 5 research applications from URMs : 395 out of 8,921 meetings (4.4%)

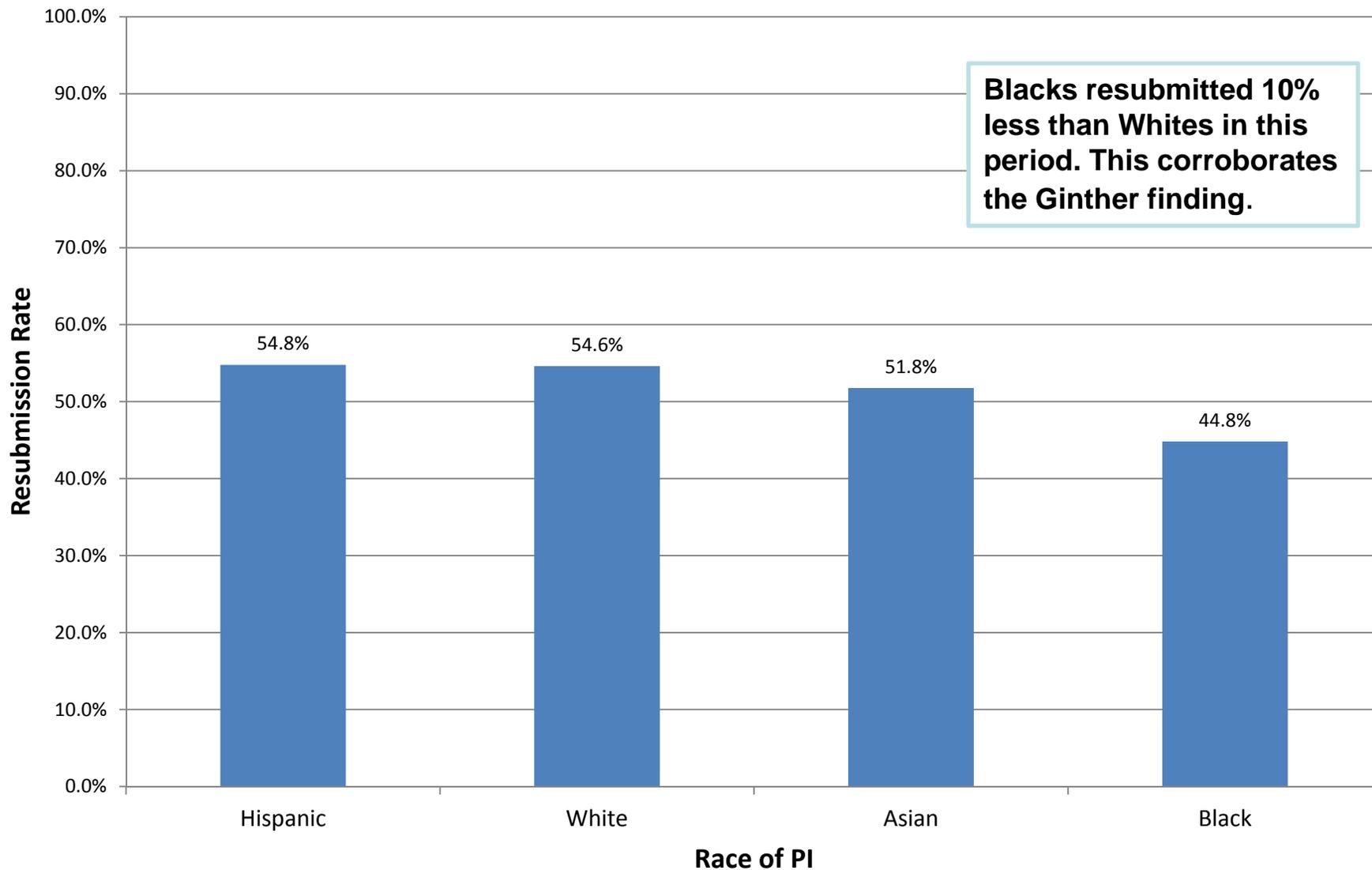


- The greater the % of white reviewers, the lower the discussion rate of URM applications – statistically significant.
- However, the relationship was weak (low correlation).
- The amount of variation in discussion rates explained by the % of white reviewers was low – only 3.0 %.
- **Conclusion: The % of white reviewers has very little influence on the discussion rates or success rates of URM applications.**



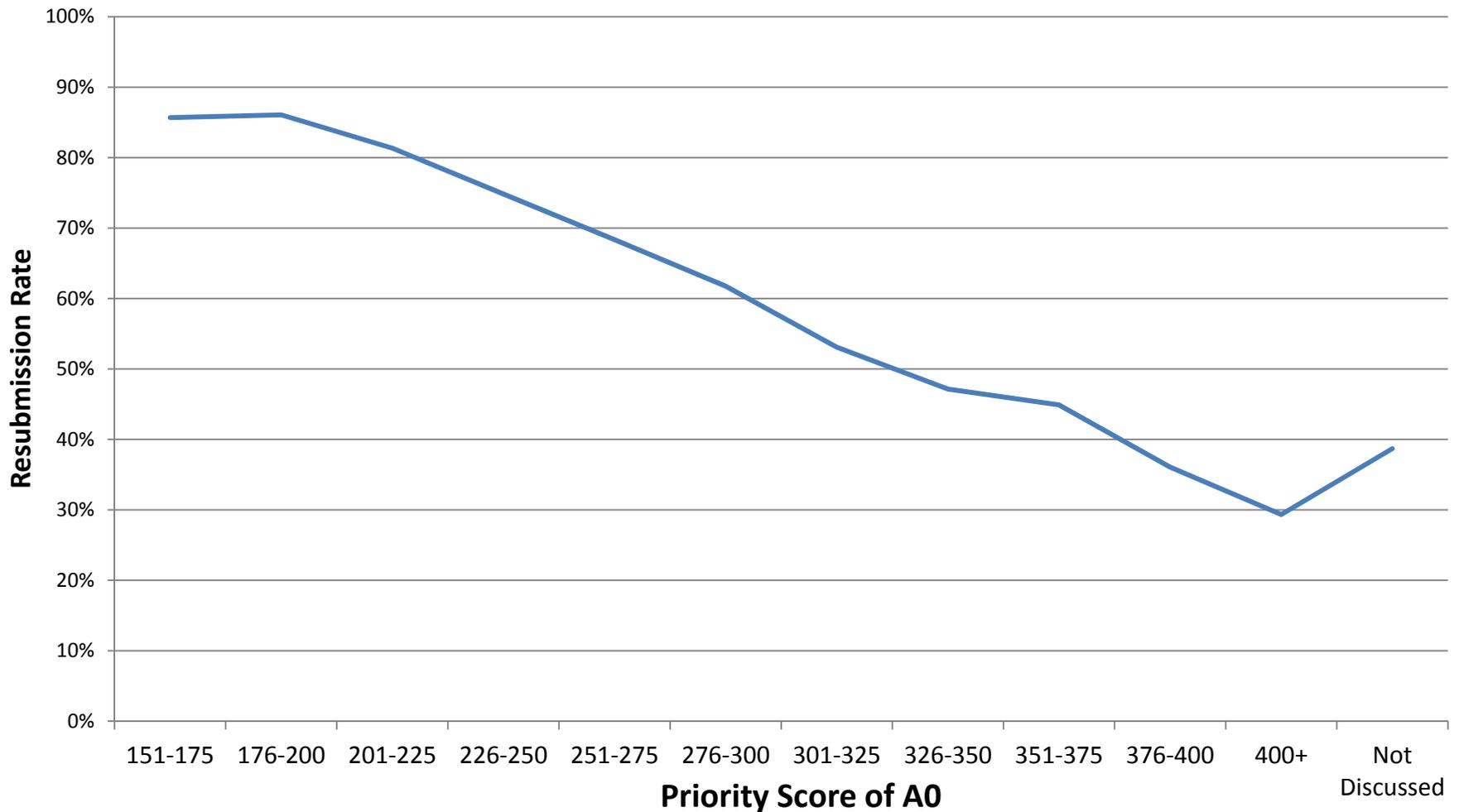
Resubmission Rate by Race/Ethnicity

Unsuccessful Unsolicited R01 Applications, FY 1999 - 2011



Resubmission Rate by Priority Score

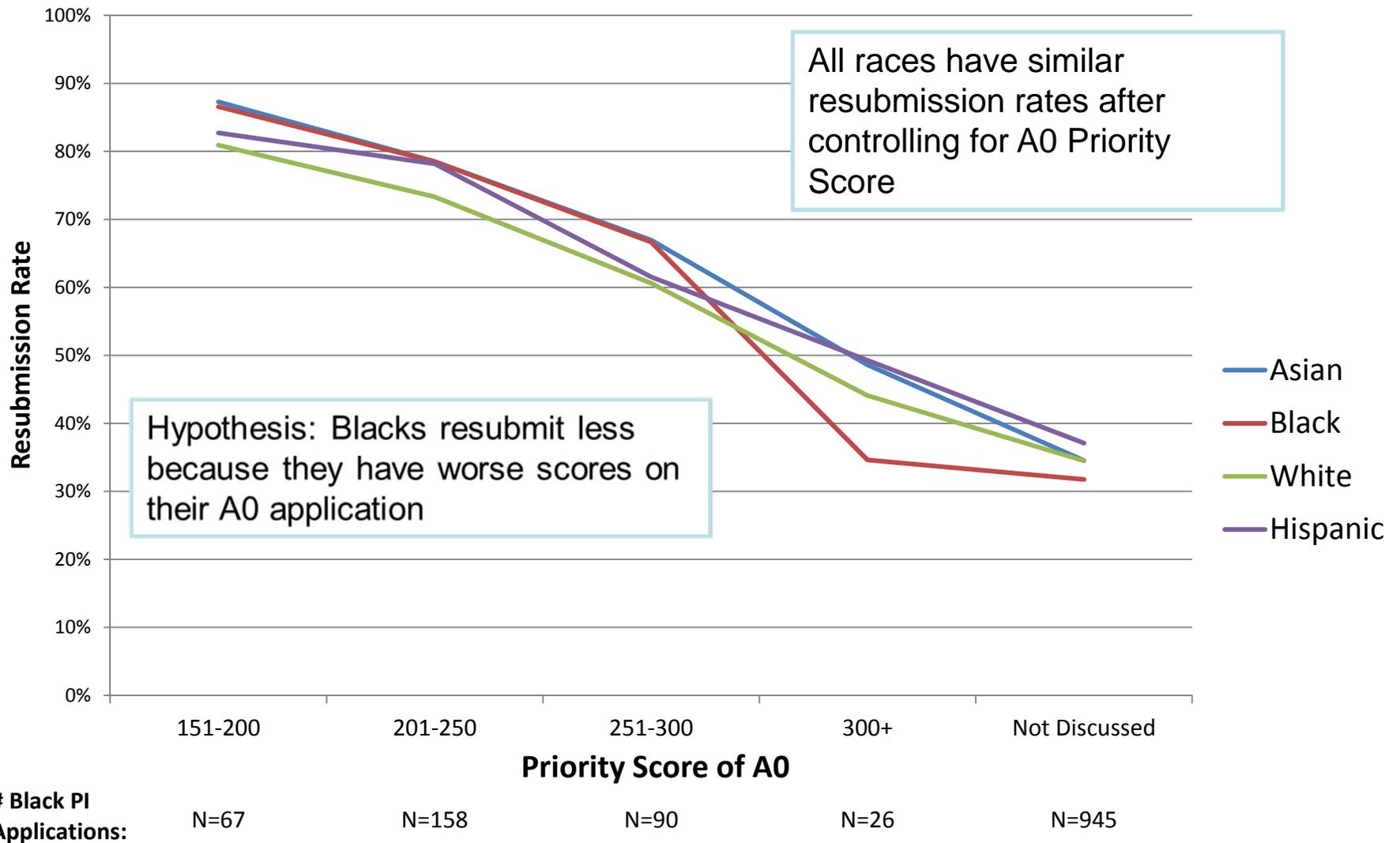
Unsuccessful Unsolicited R01 A0 Applications, FY 1999 - 2009



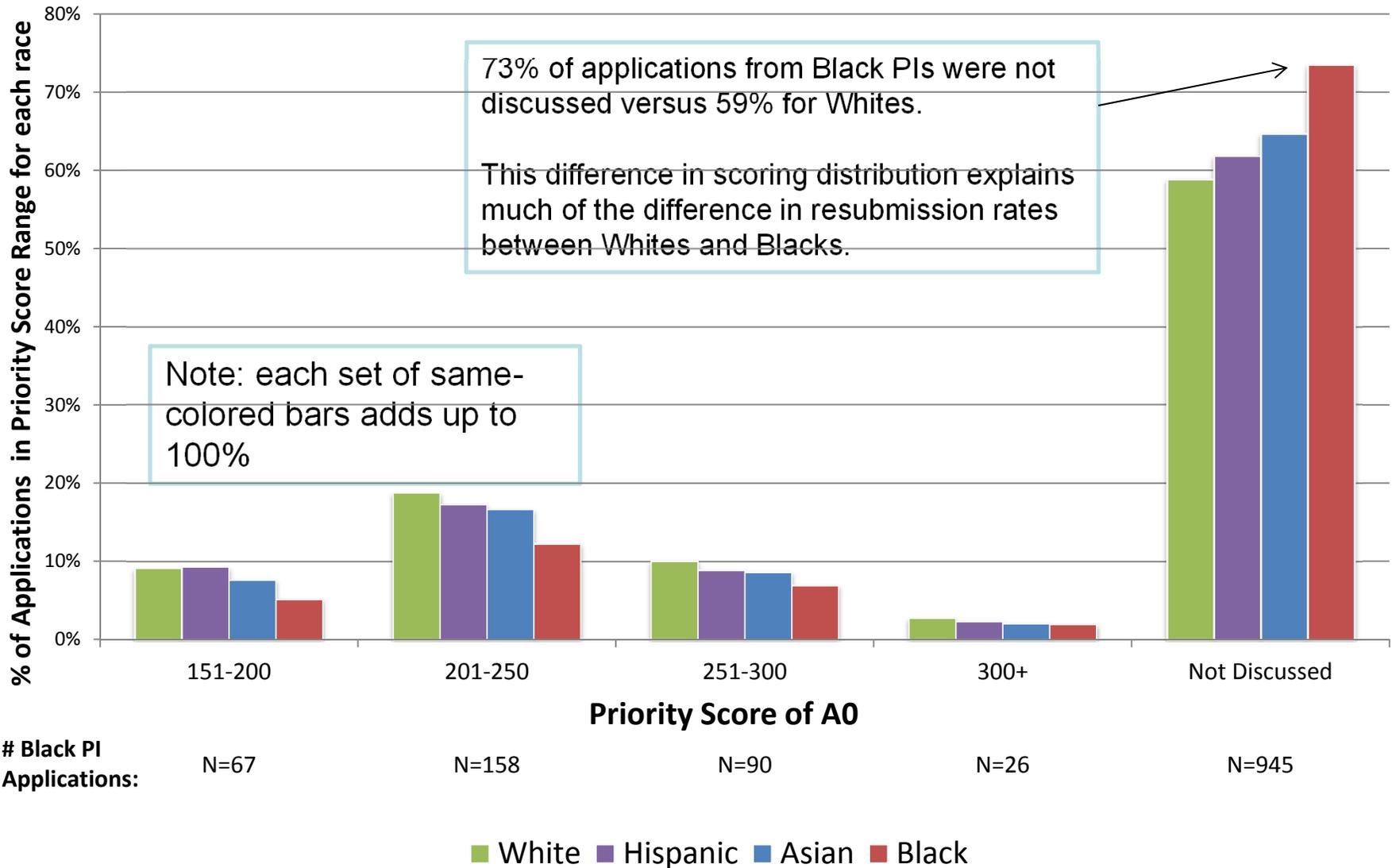
Total Applications: N=3674 N=10222 N=12263 N=11808 N=7442 N=4494 N=1614 N=838 N=343 N=183 N=133 N=67823

Resubmission Rate by Priority Score and Race/Ethnicity

Unsuccessful Unsolicited Type 1 R01 A0 Applications, FY 1999 - 2009



Distribution of Priority Scores for each Race Unsuccessful Unsolicited Type 1 A0 R01s, FY 1999 - 2009



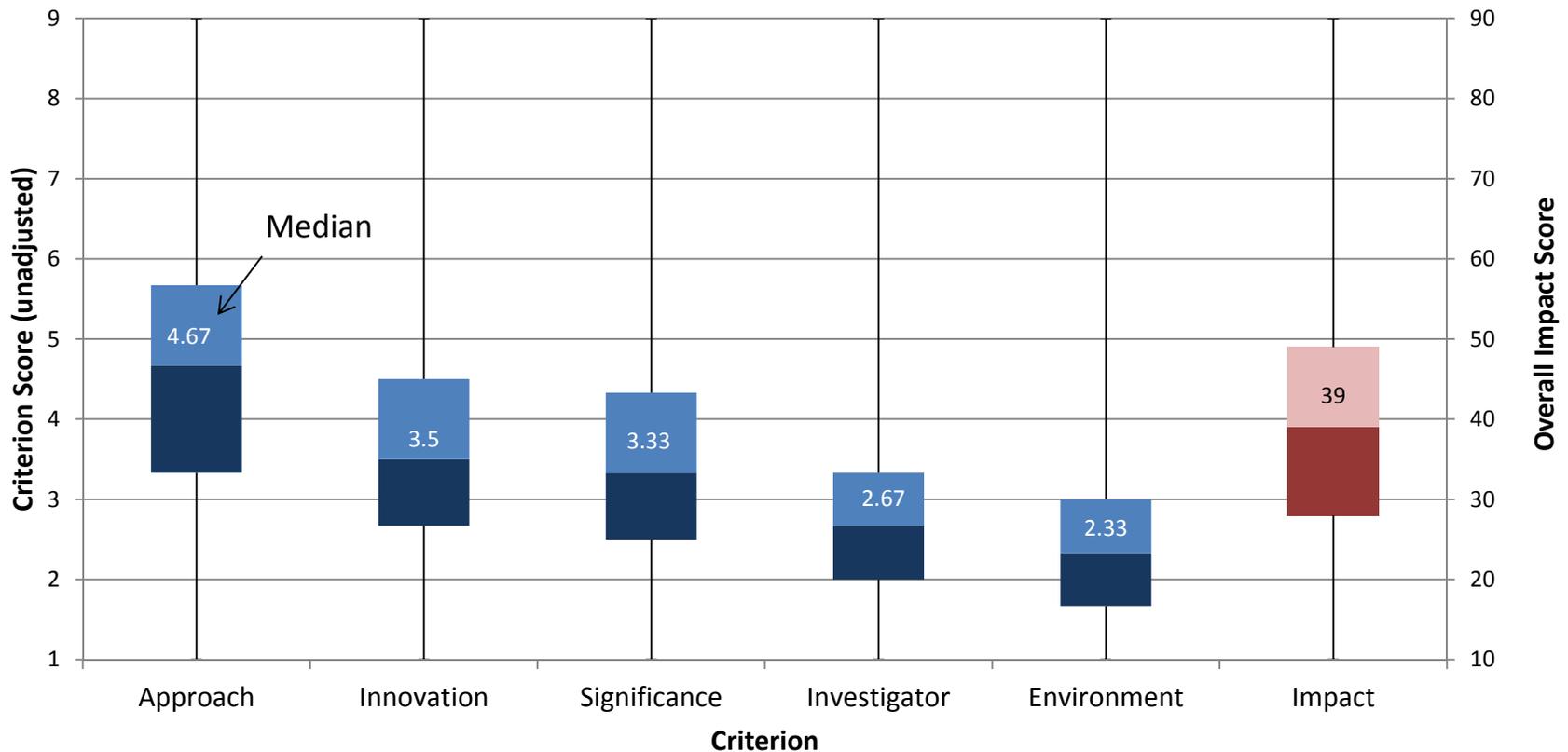
Resubmission Analysis Conclusions

- **Before** controlling for Priority/Impact/Criterion Scores (descriptive statistics):
 - Differences were observed in resubmission rates by application type, race, peer review experience of PI, funding history of PI, administering IC
- **After** controlling for Priority/Impact/Criterion scores and application type (regression models):
 - Differences in resubmission rates become small and/or statistically insignificant
- Differences in resubmission rates are due to differences in initial score of A0 applications and application type
- Of the five criterion scores, Approach is the biggest determinant of an applicant's decision to resubmit
- Differences in IC resubmission rates are largely explained by the success rates of ICs



How Criterion Scores Influence the Overall Impact Score and Funding Outcomes for NIH Peer-Reviewed Applications

Box Plot Distributions of Criterion and Overall Impact Scores
FY 2010, All Research Grant Applications



N (Criterion Scores) = 54,744
N (Impact Score) = 32,559 (discussed applications only)



Summary Statistics by Race

Race	N	Average Overall Impact*	Average Approach	Average Significance	Average Innovation	Average Investigator	Average Environment	Percent Funded
White	31686	37.8	4.4	3.3	3.5	2.6	2.4	20.8%
MPI Multiple Races†	2977	39.9	4.7	3.5	3.7	2.8	2.6	16.4%
Asian	10239	40.0	4.7	3.6	3.7	2.9	2.6	15.8%
Native Hawaiian or Other Pacific Islander	33	40.3	4.9	3.8	3.9	2.7	2.5	12.1%
Single PI Multiple Races	451	40.7	4.8	3.6	3.8	2.8	2.6	17.5%
American Indian or Alaska Native	92	41.3	4.7	3.5	3.8	3.0	2.8	18.5%
African American	834	43.1	5.2	3.8	4.1	3.3	2.9	13.2%
Withheld	1613	40.5	4.7	3.6	3.8	3.0	2.7	16.2%
Unknown	6819	43.6	5.1	3.9	4.1	3.3	3.1	12.1%
Total	54744	39.1	4.6	3.5	3.7	2.8	2.5	18.2%

Data include FY 2010 Research Grant Applications

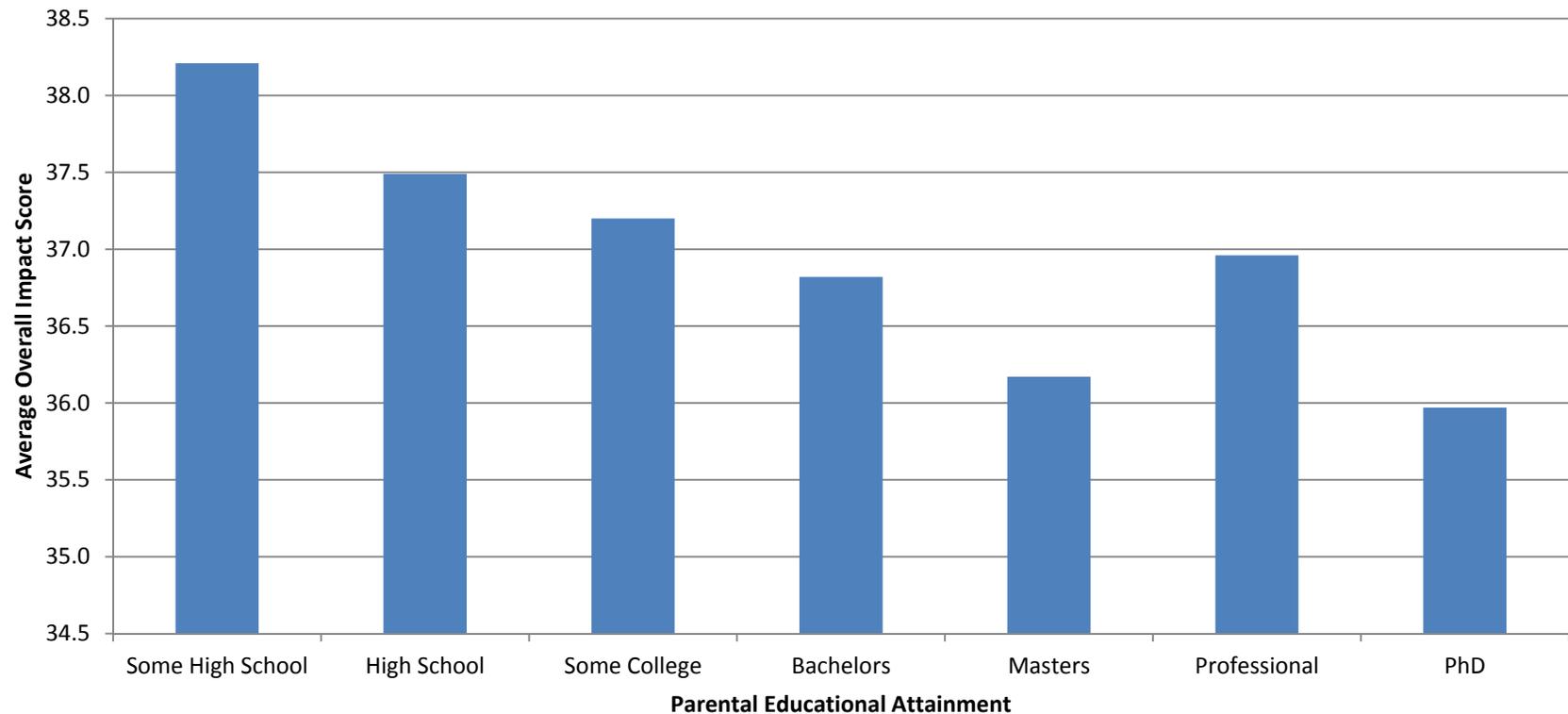
*Overall Impact Score averages only include discussed applications (N=32,599)

†: Multiple Principal Investigator (MPI) applications with principal investigators of different races



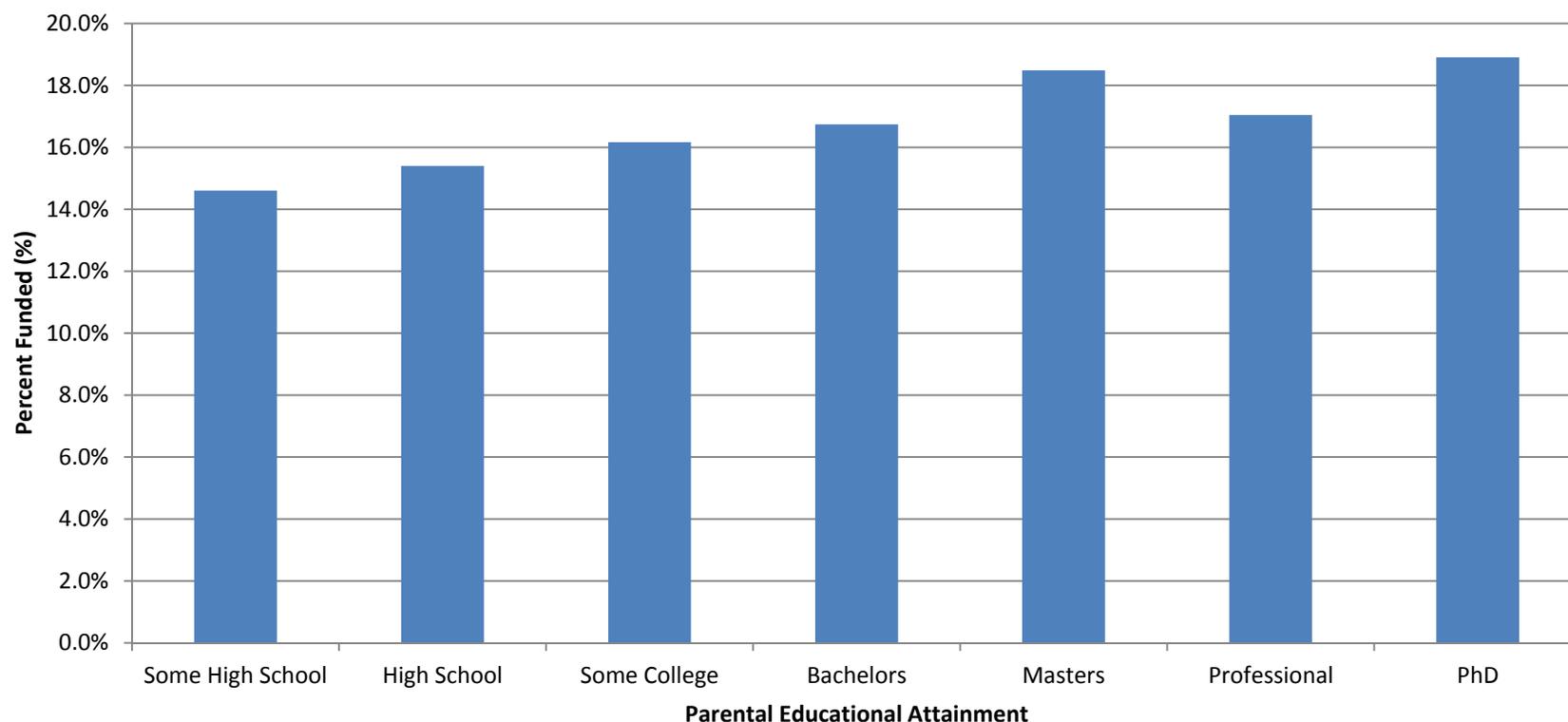
Overall Impact Scores Improve with Increasing Parental Educational Attainment of PIs

**Average Overall Impact Score By Parental Educational Attainment
For All Races
Fiscal Years 2010-2012**



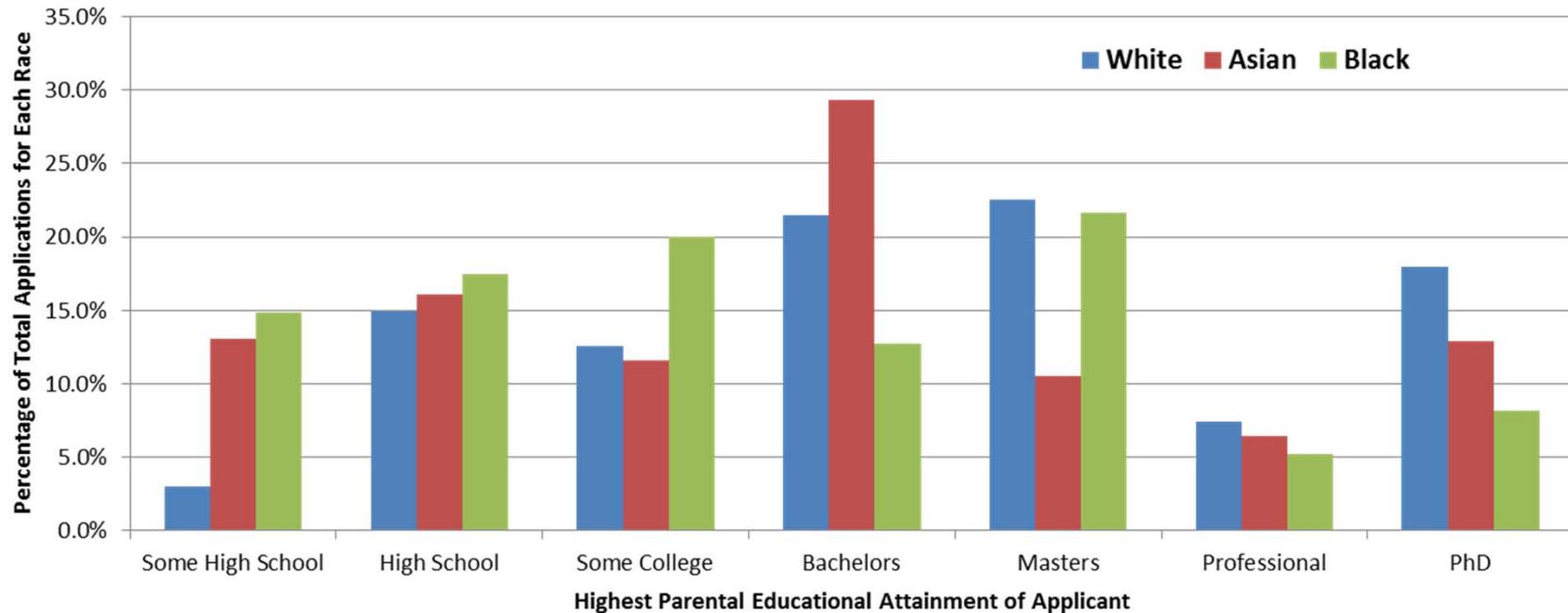
Application Award Rates Improve with Increasing Parental Educational Attainment of PIs

**Percent Funded By Parental Educational Attainment
For All Races
Fiscal Years 2010-2012**



Parental Educational Attainment Differs by Race

Highest Parental Educational Attainment* of Research Grant Applications By Race Subgroups White, Asian, and Black Fiscal Years 2010-2012

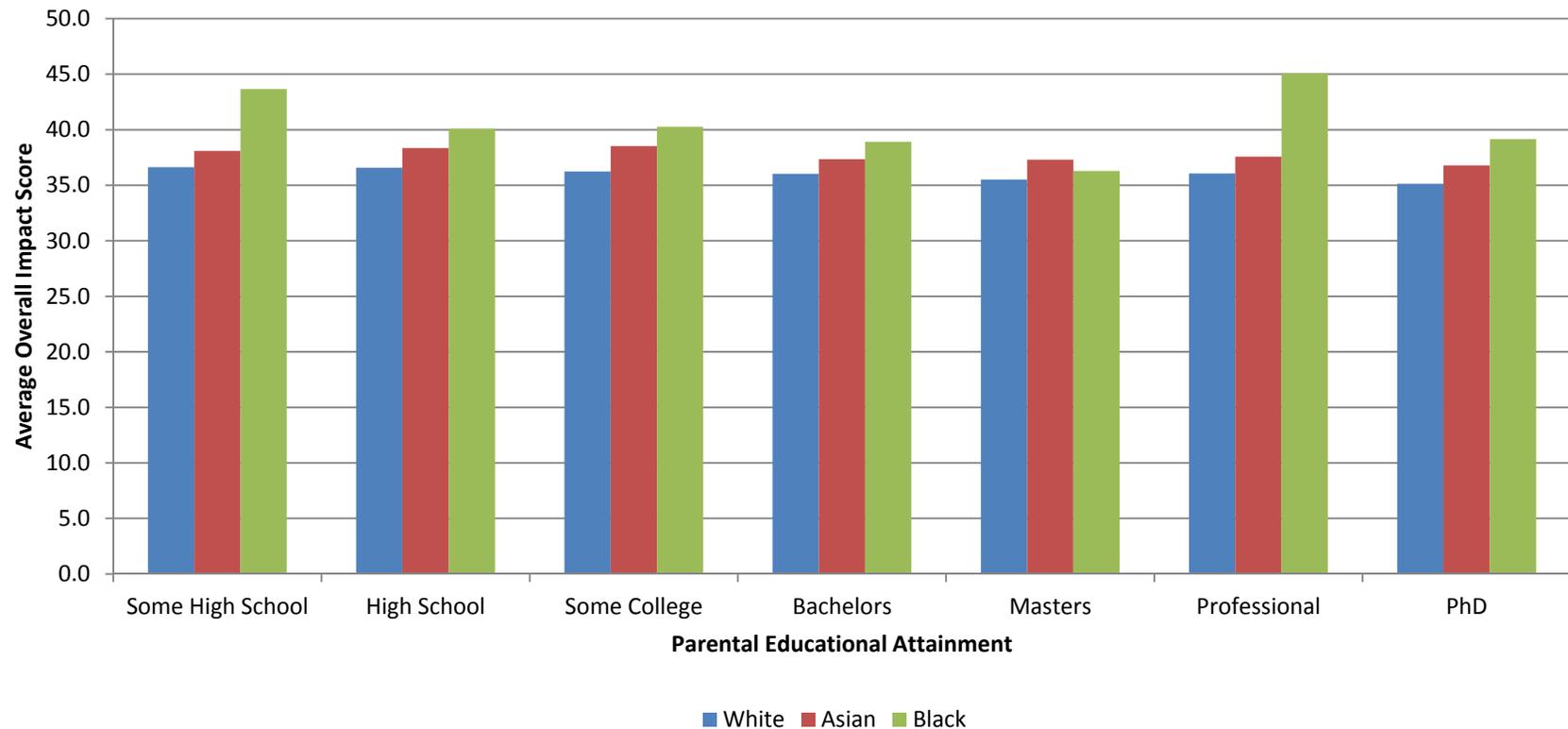


*Excluding unknown parental educational attainment



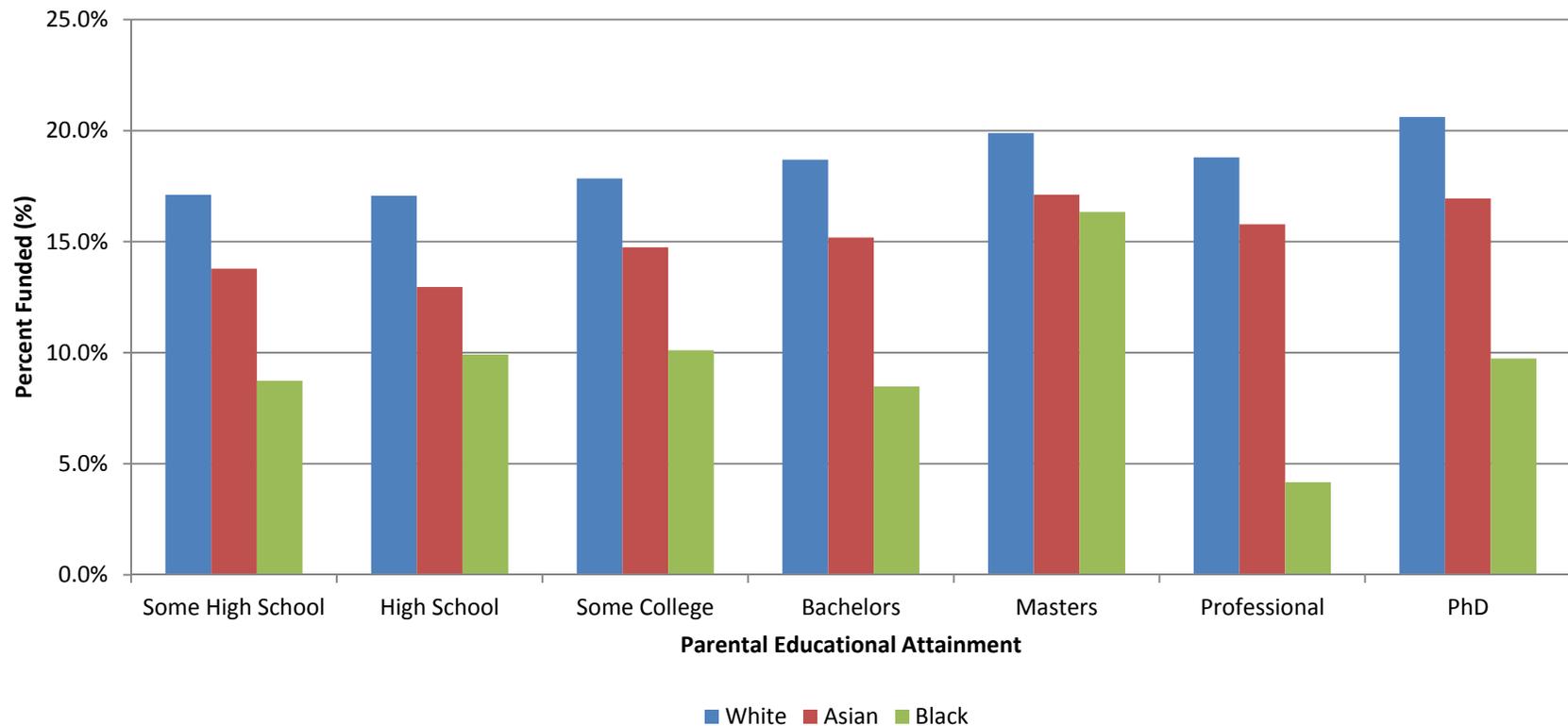
Parental Educational Attainment and Race are Associated with Overall Impact Score

**Average Overall Impact Score By Parental Educational Attainment
For White, Asian, and Black Subgroups
Fiscal Years 2010-2012**



Parental Educational Attainment and Race are Associated with Application Award Rates

**Percent Funded By Parental Educational Attainment
For White, Asian, and Black Subgroups
Fiscal Years 2010-2012**



Summary Statistics by Ethnicity

Ethnicity	N	Average Overall Impact*	Average Approach	Average Significance	Average Innovation	Average Investigator	Average Environment	Percent Funded
Non-Hispanic	32454	38.4	4.5	3.4	3.6	2.7	2.5	19.5%
Hispanic	1749	39.1	4.7	3.5	3.7	2.8	2.5	17.9%
MPI - Multiple Ethnicities	3123	39.6	4.6	3.4	3.6	2.7	2.5	17.5%
Withheld	1415	40.2	4.7	3.6	3.8	2.9	2.7	16.0%
Unknown	16003	40.5	4.8	3.6	3.8	3.0	2.7	16.0%
Total	54744	39.1	4.6	3.5	3.7	2.8	2.5	18.2%

Data include FY 2010 Research Grant Applications

*Overall Impact Score averages only include discussed applications (N=32,599)

FY 2010 Impact Regression Model Results Controlling for NIH Institutional Factors and PI Demographics/Institution

Criterion	Change in Impact Score
Approach	6.8*
Significance	3.4*
Innovation	1.4*
Investigator	1.3*
Environment	-0.5*

* Indicates significance at the 99% confidence level,

** 95% confidence level

Criterion Interpretation: Coefficients should be interpreted as the change in Overall Impact Score due to a one point increase (or worsening) in the given criterion, all else equal, e.g.,

A one point increase in the Approach score is associated with a 6.8 point increase or worsening of the Overall Impact Score

FY 2010 Impact Regression Model Results Controlling for NIH Institutional Factors and PI Demographics/Institution

Race	Change in Impact Score
African American	1.2*
Single PI Multiple Races	0.7
American Indian	0.3
Asian	0.2
PI Multiple Races†	-0.5
Pacific Islander	-0.8
Unknown	0.3
Withheld	0.2
White	-

* Indicates significance at the 99% confidence level

Interpretation: Coefficients should be interpreted as change in Overall Impact Score for an application from a given race compared to a White PI, all else equal

Comparison to Whites, African Americans receive

Ethnicity	Change in Impact Score
MPI Multiple Ethnicity††	0.2
Hispanic	-0.1
Unknown	0.0
Withheld	-0.1
Non-Hispanic	-

Ethnicity Interpretation: Coefficients should be interpreted as the change in Overall Impact Score for an application from a PI of a given ethnicity compared to a Non-Hispanic PI, all else equal

There is no significant difference in the Overall Impact Score between Hispanics and non-Hispanics, once the criterion scores are taken into account.

Multiple Principal Investigator (MPI) applications with principal

Impact and Funding Model Results FY 2011 and FY 2012

Identical Impact and Funding models were run against research grant applications in FY 2011 and FY 2012

The results are highly similar

The criterion scores, particularly Approach, are the biggest determinants of the Overall Impact Score and the probability of being funded

Among the different racial and ethnic groups, there are no statistically significant differences in Overall Impact Score or probability of receiving funding once the criterion scores and other institutional factors are taken into account

- The coefficient for Black PIs in the Impact model is attenuated and no longer statistically significantly different than zero

Summary

Differences in fields of science do not explain the disparities in success rates of African American PIs

Racial composition of SRGs is likely to have a minimal effect on the discussion or success rates of applications from different race groups

Resubmission of unsolicited, unsuccessful A01 grant applications is largely determined by the Priority/Overall Impact score and type (new or renewal) of the A0 (initial) application, rather than race or other factors evaluated

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Those who are URMs or whose parents have lower educational attainment are associated with poorer peer review outcomes

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Questions?