Percentile Ranking and Citation Impact among NIMH-funded R01 Grants

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Background

Priority scores and percentile rankings are intended to determine, "… the project's likelihood to have a sustained, powerful influence on the research field(s) involved" yet only until recently have researchers examined whether an association exists between peer-review assessments and grant outputs. A study by the National Heart Lung and Blood Institute (NHLBI) found no association between percentile rank and publication productivity or citation impact even after accounting for various attributes of the project, principal investigators (PIs), and their institutions.

Objective

Questions remain as to whether the NHLBI findings are generalizable to other areas of science and medicine since the analysis was restricted to only grants assigned to a cardiovascular unit within their institute. The purpose of this study is to reproduce and expand the analysis conducted by NHLBI using all awarded, de novo R01 grants from the National Institute of Mental Health (NIMH). The expanded analysis included the addition of a number of PI characteristics not available for the earlier NHLBI study.

Data/Methods

Data were obtained from an internal NIMH program (Program Analysis Research Information System, PARIS) and IMPAC II. 1,765 Type 1 R01s and R37s awarded from 2000 to 2009 were considered for the analysis. Publication data were extracted from PubMed and SPIRES

Our co-primary outcome measures were the number of total citations, number of publications, and the annual number of citations.

Similar to the initial NHLBI study, we conducted both multivariable linear regressions and Briman random forests to explore the association between percentile rank and grant outputs, and to examine the relative importance of predictors.

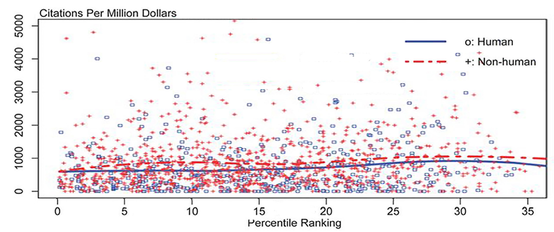
Results

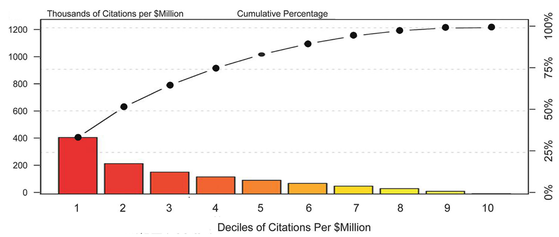
Descriptive statistics of select variables by percentile group

	Best (0-5) (N=399)	Middle (5.1-15) (N=807)	Worst (> 15) (N-551)
Percentile Rank	1.3/ 2.7/ 3.8	7.4/10.0/12.5	16.7/19.3/23.3
Annual Funding (in millions)	0.2/0.3/0.40	0.2/0.3/0.4	0.2/0.3/0.35
Institutional Funding (in millions)	13.0/35.8/73.1	10.3/23.7/64.0	9.7/26.8/70.9
Project Duration	4.9/5.9/6.9	4.9/5.8/6.8	4.9/5.8/6.6
Basic Research	61% (244)	62% (504)	65% (359)
Animal Study	32% (129)	36% (292)	39% (214)
Early Stage Investigator	2% (8)	1% (11)	2% (9)
PI Degree			
MD	21% (83)	20% (160)	18% (100)
MD/PhD	9% (36)	8% (63)	10% (54)
PhD	70% (280)	72% (582)	72% (396)
Other	0% (0)	0% (2)	0% (1)
PI Degree Year	1980/1987/1992	1979/1987/1992	1980/1987/1993
Division			
CMHRA	1% (2)	0% (0)	0% (0)
DAHBR	7% (29)	5% (41)	2% (12)
DATR	8% (30)	9% (74)	6% (35)
DDTR	2% (9)	2% (14)	3% (14)
DMDBA	12% (48)	12% (96)	15% (82)
DNBBS	53% (210)	57% (459)	64% (352)
DPTR	2% (7)	2% (15)	1% (6)
DSIR	16% (64)	13% (108)	9% (50)
Primary Field of Study of PI			
Biological Sciences	36% (145)	37% (295)	40% (219)
Biology-Related Psychology	10% (41)	12% (93)	12% (66)
Clinical/Counseling Psych.	9% (36)	11% (86)	7% (37)
Miscellaneous	8% (33)	7% (57)	7% (36)
Other Medical Sciences	4% (16)	4% (33)	5% (25)
Other Psychology	10% (39)	9% (76)	10% (54)
Psychiatry	19% (76)	17% (140)	18% (100)
Social Sciences	3% (13)	3% (27)	3% (14)

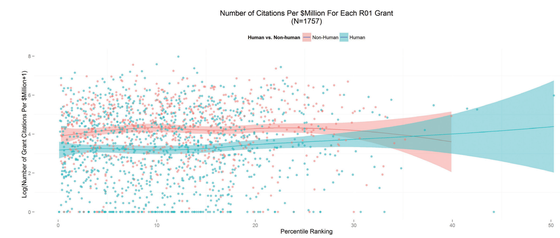
Results

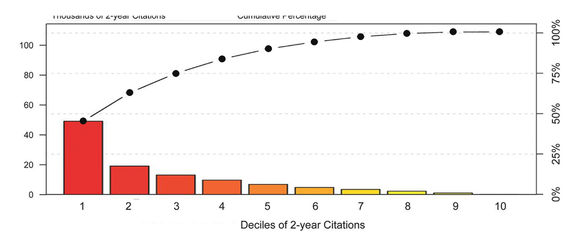
Original NHLBI Analysis





NIMH Analysis

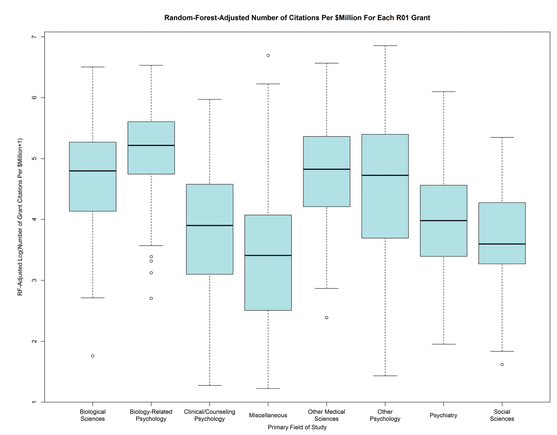




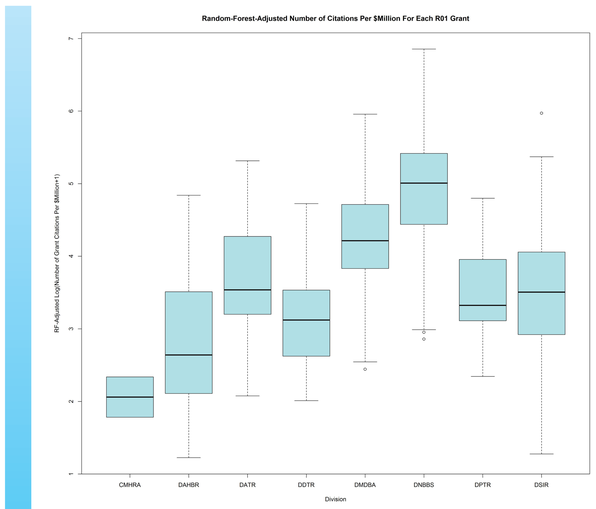
NIMH Only Random Forests

Number of Citations Top 5 Predictors

1. Calendar Time
2. Division
3. Primary Field of Study of PI
4. PI Discipline
5. Primary Problem Investigated

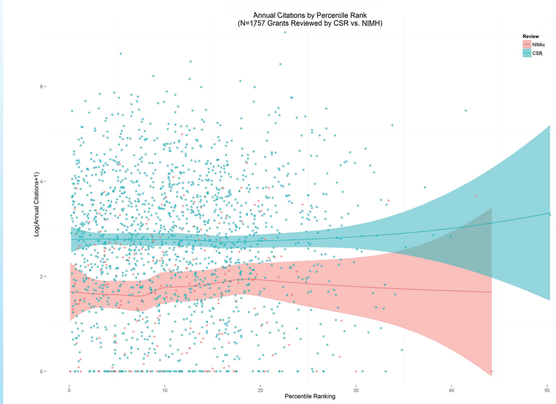


Number of Citations per Million by Division and Primary Field of Study



Our results validate prior findings by NHLBI. In both studies, a relatively small percentage of grants accounted for a large percentage of grant-attributed citations. Twenty percent of the most productive grants generated 72% of the citations received. We also found no association between percentile rank and a range of bibliometric indicators. The lack of association between percentile rank and citations per million and H-index persist even after controlling for attributes of the PI at the time they apply, institutional funding, and other characteristics of the research they proposed. The most important predictors of citations per million were calendar time, NIMH division, and the PI's primary field of study. The most important predictors of annual citations were project duration, division, and calendar time. Percentile ranking was not an important predictor for either outcome.

Results



Conclusion

NIMH did not find an association between percentile ranking and measures of productivity even after including additional characteristics not in the original NHLBI study and diverse scientific areas aligned with NIMH's mission. These findings suggest that the lack of association between peer-review assessments and certain grant outputs can be generalized to a broader set of NIMH-related areas of science and medicine.

References

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