



Background

- The American Recovery and Reinvestment Act (ARRA) allowed National Heart, Lung, and Blood Institute (NHLBI) to fund R01 grants that fared less well on peer review than those funded by meeting a payline threshold

Objectives

- To compare the citation impact of ARRA-funded de novo NHLBI R01 grants (ARRA-R01) with concurrent de novo NHLBI R01 grants that met standard payline (Reg-R01)

Methods

- Using NIH Research Online Portfolio Reporting Tools, de novo new R01 grants funded by NHLBI in fiscal year 2009 were identified and described
- A citation percentile value for each publication was obtained using InCites (Thomson-Reuters) a citation impact tool, which measures how often the article was cited compared with publications that were published in the same year, were of similar type (review, research, report, book chapter, etc.), and focused on the same scientific topic. The normalized citation impact for each paper was calculated by $(100 - \text{percentile})/100$ (Table 2)
- The Relative Citation Ratio (RCR) was obtained using iCite, a tool developed within the NIH Office of Portfolio Analysis. RCR represents a citation-based measure of scientific influence a publication and it is calculated as the cites/year of each paper, normalized to the citations per year received by NIH-funded papers in the same field and year

Results and Discussions

- The ARRA-R01s were shorter in duration and lower in budget (Table 1)
- The Reg-R01s yielded 3895 publications and a normalized citation impact of 2586. There were 954 publications (24%) that were top 10% publications

Results and Discussions Continued...

- The ARRA-R01s yielded 996 publications and a normalized citation impact of 651, with 231 (23%) top 10% publications
- The Reg-R01 yielded more publications and had higher normalized citation impacts, but the differences between Reg-R01 and ARRA-R01 disappeared when accounting for \$million spent (Table 2; Figure 1)
- In multivariable analyses, the mechanism of funding continued to be unrelated to normalized citation impact per \$million ($P=0.82$). By random forest machine learning regression, the grant mechanism (Reg-R01 and ARRA-R01) was the least important predictor, whereas the total award amount was the most important predictor (Figure 2)
- The ARRA-R01 grantees did not have prior knowledge of ARRA funding, and their original proposals were not tailored to any ARRA funding solicitations
- The Reg-R01 showed higher normalized RCR outcomes (Table 3, Figure 3), however the differences between Reg-R01 and ARRA-R01 disappeared when accounting \$million spent (Table 3, Figure 4)

| Table 1. Grant Characteristics | Reg-R01 (N = 458)* | ARRA-R01 (N = 165)* | P-value |
|--------------------------------|--------------------|---------------------|---------|
| Percentile Ranking | 6/10/14 | 20/23/25 | < 0.001 |
| Project Duration (Years) | 4.8/4.9/5.0 | 2.8/3.0/3.3 | < 0.001 |
| Total Award (\$M) | 1.6/1.9/2.3 | 0.8/1.0/1.6 | < 0.001 |
| Requested Budget (\$M) | 1.8/1.9/2.3 | 1.8/1.9/2.4 | 0.41 |
| Clinical Trial | 7% (33) | 7% (11) | 0.82 |
| Human Study | 44% (201) | 35% (57) | 0.037 |
| Animal Study | 64% (293) | 67% (110) | 0.54 |
| Early Stage Investigator | 19% (88) | 9% (15) | 0.003 |
| Prior Council Meetings | 0/0/0 | 0/0/0 | 0.95 |
| Prior Study Section Meetings | 0/3/13 | 0/3/9 | 0.66 |
| Prior SEP Meetings | 1.0/5.5/12.0 | 2.0/4.0/11.0 | 0.26 |
| Prior Projects | 1/2/5 | 1/3/4 | 0.7 |
| Prior Total Funding (\$M) | 0.5/1.9/8.0 | 0.6/2.7/8.1 | 0.33 |

| Table 2. Bibliometric and Economic Outcomes | Reg-R01 (N = 458)* | ARRA-R01 (N = 165)* | P-value |
|---|--------------------|---------------------|---------|
| Publications | 3/7/11 | 2/4/8 | <0.001 |
| Normalized Citation Impact | 1.6/3.8/7.6 | 0.9/2.8/5.0 | <0.001 |
| Top-10% Publications | 0.0/1.0/2.5 | 0.0/0.0/2.0 | 0.008 |
| Publications per \$M | 1.3/3.3/6.3 | 1.3/3.6/7.2 | 0.42 |
| Normalized Citation Impact per \$M | 0.8/2.0/4.1 | 0.7/2.2/4.7 | 0.61 |
| Top-10% Publications per \$M | 0.0/0.5/1.3 | 0.0/0.0/1.3 | 0.23 |

| Table 3. Relative Citation Ratio | Reg-R01 (N = 458)* | ARRA-R01 (N = 165)* | P-value |
|----------------------------------|--------------------|---------------------|---------|
| Grant total RCR | 1.7/4.8/10.7 | 0.7/3.3/8.2 | 0.003 |
| Grant total RCR per \$million | 0.9/2.6/5.9 | 0.8/3.3/6.5 | 0.62 |

*Continuous variables are presented as a/b/c where a=25th percentile, b=median, and c=75th percentile. Categorical variables are presented as percent (number)

Disclosures: None

Figure 1.

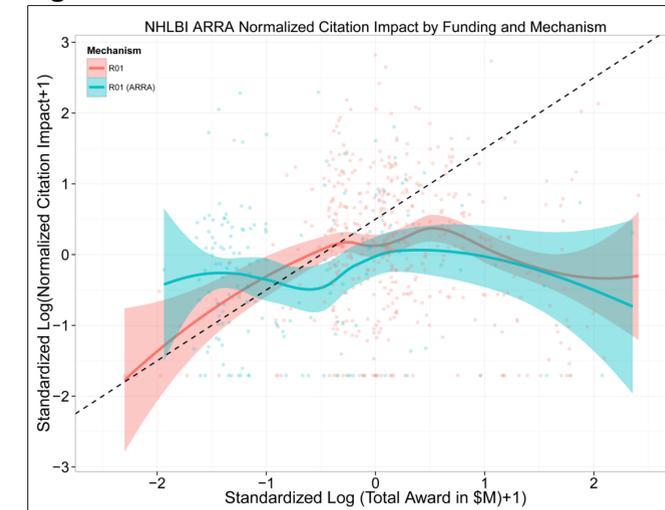
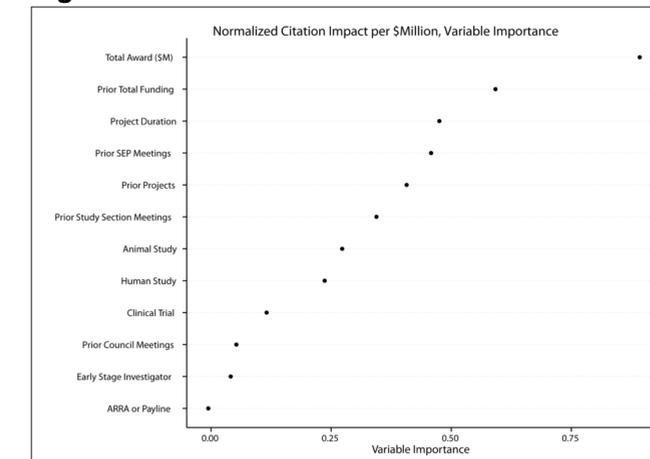


Figure 2.



Limitations

- Citation measures reflect only one measure of scientific impact
- ARRA-R01s were allowed to revise the scope of the project and the budget to be accomplished in two years. It is not known if such revisions along with the programmatic input had any implications in the outcome of the projects

Conclusions

- ARRA-R01 had comparable citation outcomes per \$million spent to that of contemporaneously funded Reg-R01. These findings suggest that policies to expand research funding are likely to yield reasonable outcomes

Additional data: Circulation Research 2015;116:784-788

Figure 3.

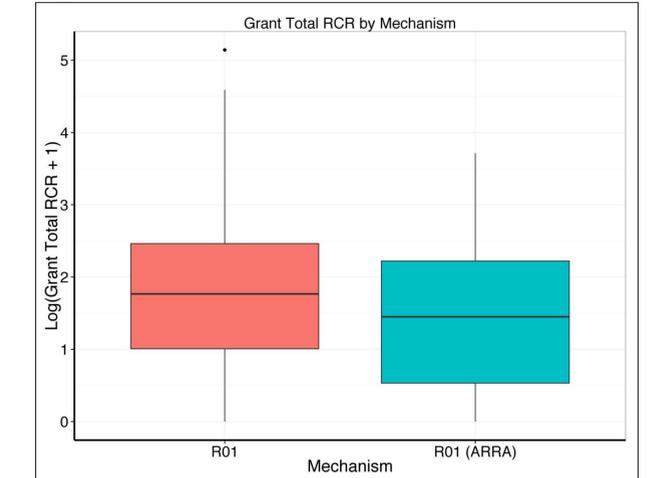


Figure 4.

