Assessing the Value of Team Science
A Study Comparing Center- and Investigator-Initiated Grants

Kara L. Hall, PhD, Daniel Stokols, PhD, Brooke A. Stipelman, PhD, Amanda L. Vogel, PhD, MHS, Annie Feng, PhD, Beth Masimore, PhD, Glen Morgan, PhD, Richard P. Moser, PhD, Stephen E. Marcus, PhD, David Berrigan, PhD

Appendix A

Materials and Methods

Sample

Transdisciplinary tobacco use research centers and subprojects (TTURCs). Seven TTURCs were funded during the first 5-year funding cycle of the TTURC initiative (1999–2004). In 2004, six of the seven original centers were renewed, and one new center was funded, for another 5-year funding cycle. To examine longitudinal productivity and impact, the six TTURCs that were continuously funded from 1999 through 2009 were included.

NIH Research Grant Program (R01) grant comparison groups. Two comparison groups of investigator-initiated tobacco use research grants funded through the R01 grant mechanism were generated. A preliminary pool of candidate R01 grants was created using a combination of text-based matching and a keyword search method for R01 grants extracted from IMPACII (Information for Management, Planning, Analysis, and Coordination II), an NIH-wide grants management database. The initial search yielded a group of 458 candidate R01 grants, which was subsequently screened by tobacco scientists to identify grants that matched the duration, timing, scope, and topical focus of the TTURC subprojects.

This process yielded two comparison groups. The longitudinal R01 (LR01) award group (n=21) was designed to match the 10-year duration and consistent institutional infrastructure and resources of the six continuously funded TTURCs (1999–2009). Additionally, to minimize historical factors that could influence the outcomes of interest, the group was matched to the TTURC funding period. This group was comprised of R01 grants funded for 10 years, with at least 9 of these 10 years falling between 1999 and 2009.

The stacked R01 (SR01) award group (n=39) was designed to match the duration and funding periods of the 39 primary research subprojects undertaken at the six TTURCs. The majority (n=33) of TTURC subprojects were conceptualized and designed as 5-year studies and carried out during a single TTURC funding cycle. A small number of these subprojects (n=6), however, were sustained across the two funding cycles. The SR01 comparison group was comprised of 39 R01 grants that approximated the beginning and end dates of these 39 subprojects.

Extraction of Publication Data

Publication data and information needed to link publications to associated grants were extracted from multiple databases. Publications associated with the TTURC and R01 grants were identified using an automated process applied to two NIH systems that link project records from IMPAC II (the NIH grant information database: Information for Management, Planning, Analysis, and Coordination) to publication records in MEDLINE, the National Library of Medicine's bibliographic database. These two systems, called SPIRES (Scientific Publication Information Retrieval System) and eSPA (electronic Scientific Portfolio Assistant), provide detailed information about publications that acknowledge NIH grant support. To check for accuracy, publication data gathered through this automated process were compared to publication data from a random selection of annual progress reports for the TTURC and R01 grants. In addition, whenever the automated process identified zero publications for a grant, this information was verified in the related progress reports. Annual progress reports are mandatory and submitted by researchers who receive NIH grants; they include documentation of annual publications directly related to the grant. To obtain annual journal impact factors for the identified publications, *Journal Citation Reports* [1] was used in the current study.

Assigning Transdisciplinary Tobacco Use Research Center Publications to Subprojects

For a subset of analyses, productivity was compared at the project level and comparisons of TTURC subprojects with R01 grants were made (in contrast to comparisons of the overall productivity of each group). Since publications produced by each TTURC center acknowledged a common center-based grant number, a combination of data-extraction strategies using both the automated bibliometric databases described above (i.e., SPIRES and eSPA) as well as manual reviews of grant project reports was used to assign publications to each of the TTURC subprojects. Three criteria were used to make initial assignments: (1) the subproject had to be in the TTURC center associated with the grant number acknowledged in the publication; (2) the subproject had to have started before a given paper was published (i.e., subprojects unique to the second TTURC funding cycle could not be assigned to papers published before that funding cycle began); and (3) the publication had to include the subproject principal investigator (PI) as an author. For papers that were unassigned after this process, author lists were then compared to key personnel lists obtained from annual progress reports. Each candidate subproject received a score based on the number of personnel names that matched publication authors. Personnel names associated with multiple subprojects received less weight than names that were associated with single subprojects. Using these criteria, 372 of 548 publications could be assigned to one subproject unambiguously.

The remaining 176 publications were manually reviewed by PhD-level tobacco use research experts and assigned to subprojects based on publication information included in the annual progress reports and a topical match between the subproject and the publication. Eighteen of these publications were assigned to subprojects, but most (n=145) were assigned to a center's core or developmental pilot project (n=145), and 13 were assigned to a "multi-center" project category that reflected collaborative work among the TTURCs. Based on manual reviews, these multi-center publications were attributed to core activities.

Publications assigned to cores, developmental pilot projects, and the multi-center category were included in our analyses of the overall productivity of the TTURCs but were excluded from analyses that examined productivity at the subproject level because they were thought to be qualitatively different from publications that resulted directly from scientific subprojects and R01 grants. This rule was adopted both to maximize comparability of the research publications produced by TTURCs and R01 grants, and to

ensure that the assessment of productivity differences between the two groups did not confer unfair advantage to the TTURCs.

Measures

Bibliometric Indicators of Collaboration, Productivity, and Impact

Several bibliometric indicators were used to assess scientific collaboration, productivity, and impact of the TTURCs and R01 grants, including average number of authors per publication per year, total number of publications per year, total number of cumulative publications, and average journal impact factor per year. To compare productivity among groups, differences in funding duration were controlled for by calculating the average number of publications per project year. As described above, TTURC publications assigned to the cores, developmental pilot projects, and multi-center project category were excluded from comparisons at this level.

Covariates

Information was extracted from IMPAC II or obtained from manual reviews of grant applications to assess potential covariates, including the PI's academic rank at the time of the award (Professor, Associate Professor, Assistant Professor, other); number of additional grants led by the PI at the time of award (0, 1–2, 3–4, 5–6); and type of research study (clinical study, laboratory/basic animal study, epidemiology/surveillance study, or policy research). Type of research study was assigned by PhD-level program staff based on manual review of the study abstract provided in the grant application.

Data Analyses

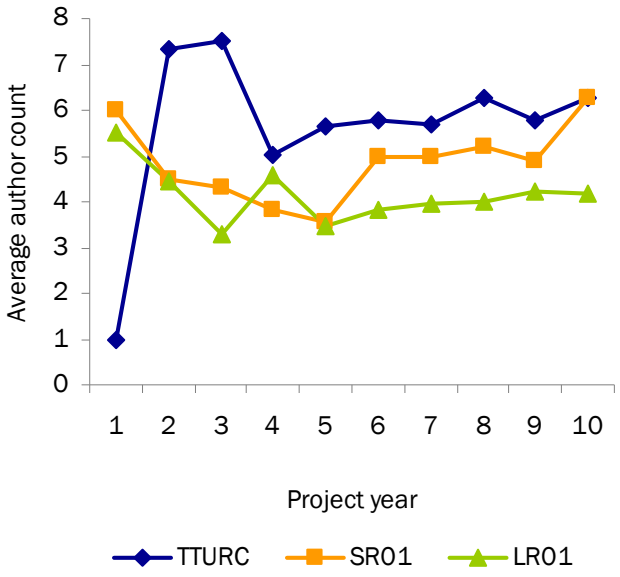
In order to create comparison groups with sufficient numbers of matched grants, the start dates for the grants included in this study varied. For instance, the first round of TTURCs started in 1999, whereas the R01 comparison grants started between 1998 and 2001. Publications were therefore linked to a "project year" for each grant (e.g., Year 1 of a given study) in order to make comparisons across studies. Significance testing for overall differences on bibliometric outcomes between TTURC and R01 groups was conducted in SPSS, using a series of pairwise comparison *t*-tests. Chi-square analyses were conducted to assess the differences between groups on selected project characteristics.

References for Appendix A

1. Thomson-Reuters. Journal citation reports 2010. thomsonreuters.com/products_services/science/science_products/a-z/journal_citation_reports/

Appendix B

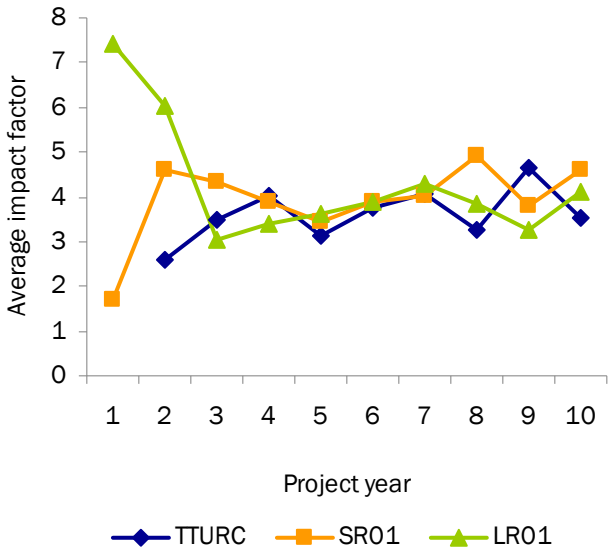
Average number of publication coauthors per year by group



LR01, long R01 grant; R01; NIH Research Grant Program; SR01, stacked R01 grant; TTURC, Transdisciplinary Tobacco Use Research Center

Appendix C

Average journal impact factor of publications per year by group



LR01, long R01 grant; R01, NIH Research Grant Program; SR01, stacked R01 grant; TTURC, Transdisciplinary Tobacco Use Research Center