Leveraging Longitudinal Network Analysis to Evaluate Interdisciplinary Collaboration

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Introduction

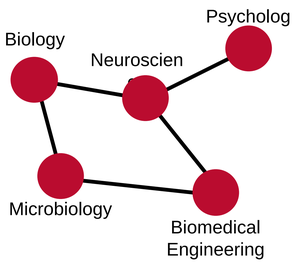
- Interdisciplinary collaboration and research is essential for advancing science and addressing critical societal challenges (Uzzi et al., 2013).
- Unfortunately, many interdisciplinary partnerships fail due to psychological and practical boundaries to collaboration (Cummings & Keisler, 2007)
- The Clinical and Translational Science Award (CTSA) program is an NIH initiative aimed at increasing the efficiency with which medical research is translated into practice by alleviating barriers and incentivizing interdisciplinary research
- This study examines the networks of interdisciplinary publications produced by 64 CTSA-funded research hubs over 10 years to evaluate the impact of the CTSA program and identify hub attributes that are associated with interdisciplinary publication rates.
- On the one hand, multi-disciplinary hubs may *encourage* interdisciplinarity because there are more disciplines (H1); on the other hand, multi-disciplinary hubs may be more susceptible to external "shocks" that hinder collaboration (H2)

Method

Step 1: Identified all CTSA-funded hubs & collected publication data from 2006-2017 using the NIH RePorter system, resulting in a total of 61678 publications produced by 64 hubs

Step 2: Categorized publications into research areas using the Web of Science Research Area (WoSRA) scheme of 252 categories

Step 3: Created networks: nodes = disciplines; ties = presence of publications that span multiple research domains



Key Findings

Is the NIH Clinical and Translational Science Award (CTSA) program effective in encouraging interdisciplinary science?

Yes! Overall, CTSA hubs are experiencing an increase in the rate of interdisciplinary publications… However, most hubs also experience a 'leveling off' effect or 'saturation point' in interdisciplinarity

Is the interdisciplinary output of CTSA hubs that link multiple institutions hit harder if the hub experiences a major "shock" (i.e., a loss of funding)?

Yes! The hubs with BOTH a high number of institutions AND a high decrease in funding experienced the steepest 'levelling-off' effect

Analyses & Results

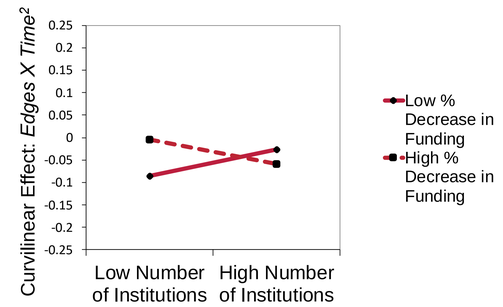
Step 1: Estimated ***temporal exponential random graph models* (TERGM)** for each of the 64 hubs to determine:

(1) The extent to which the likelihood of ties between research areas increased over time (*edges x time)*

(2)The extent to which there was a levelling-off effect over time (*edges x time*^{2})

Step 2: Used multivariate analysis to test our hypotheses about hubs

F-values reported Variable	DV1: *edges x time*	DV2: *edges x time*^{2}
Control covariate: Year first pub.	32.72**	17.32**
IV1: Number of institutions	.04	.01
IV2: Percent decrease in funding	.25	1.25
Interaction effect: Institutions x Percent decrease in funding	9.38**	9.14**



Discussion

- Overall, the CTSA is successfully promoting the production of interdisciplinary research
- However, some CTSA-funded hubs are experiencing a steeper "levelling-off" effect where the rate of increase in interdisciplinary publications stagnates
- Interventions to "bring institutions together" to incentivize interdisciplinary research may not always be the best approach, particularly if funding is likely to be uncertain or unstable

References

Uzzi, B., Mukherjee, S., Stringer, M., & Jones, B. (2013). Atypical combinations and scientific impact. *Science, 342*, 468-472.

Cummings, J. N., & Keisler, S. (2007). Coordination costs and project outcomes in multi-university collaborations. *Research Policy, 36*, 1620-1634.