

The Collaboration Readiness of Transdisciplinary Research Teams and Centers: Early Findings from the NCI TREC Baseline Evaluation Study

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**NCI Conference on the Science of Team Science:
Assessing the Value of Transdisciplinary Research**

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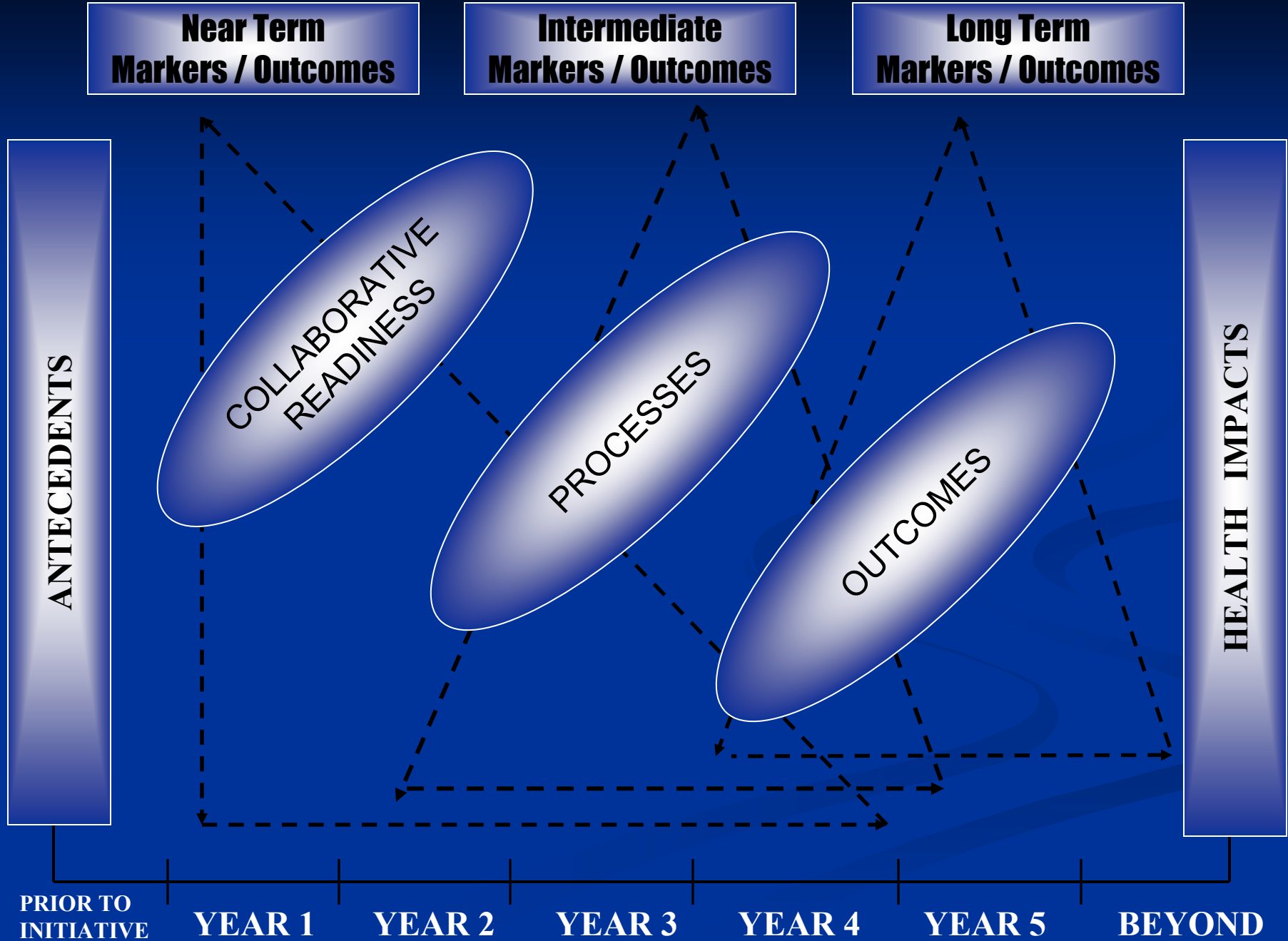
TREC Evaluation: Year 1 Study Goals

- Gather baseline and near-term data for large 5-year transdisciplinary initiative
- Develop & assess new evaluation tools
 - Collaboration readiness measures
 - Written products assessment protocol
- Provide draft measures & protocols that are applicable beyond the current study
- Explore links among collaborative readiness dimensions and other baseline survey data

Objectives for Today

- **Briefly describe TREC Baseline Evaluation**
 - Introduce conceptual model of evaluating collaborative initiatives
- **Discuss development of Research Orientation Scale**
 - Provide preliminary results
- **Discuss development of Written Products Protocol**
 - Provide preliminary results

Conceptual Model for Evaluating Collaborative Initiatives



TREC Evaluation

- **Transdisciplinary Research on Energetics and Cancer (TREC) initiative**
 - \$54 million NCI initiative began in the fall of 2005
 - Includes four research centers and one coordinating center
 - The TREC centers aim to:
 - Foster collaboration among transdisciplinary teams of scientists
 - With the goal of accelerating progress toward reducing cancer incidence, morbidity, and mortality associated with obesity, low levels of physical activity, and poor diet.
 - Provide training opportunities for new and established scientists
 - With the goal of carrying out integrative research on energetics and energy balance.
- **Participants for Baseline Survey**
 - TREC PI's, Co-I's and Professional Research Staff (e.g., statisticians)
 - 76 eligible researchers
 - 56 respondents
 - Final response rate
 - 74%

Baseline Survey Dimensions

- **History of Collaboration**
 - Collaborators, inter/trans projects/centers
- **Research Orientation**
- **Semantic Differential**
 - Ratings of affective experiences
- **Fields of Training**
- **Training**
 - Attitudes, Activities
- **Collaborative Resources**
 - Institutional resources
 - Collaborative attitudes
- **Collaborative Processes**
 - Collaborative productivity, interpersonal collaboration
- **Collaborative Activities**
 - TREC, general

Research Orientation Scale (ROS): Development

- **Component of collaborative readiness**
- **Designed to assess “continuum” of disciplinary integration as defined by Rosenfield**
 - Unidisciplinary
 - Multidisciplinary
 - Interdisciplinary
 - Transdisciplinary
- **Created items that “tap” into each of the four types of research orientation/ disciplinary integration**
- **As far as we know - first attempt to create a comprehensive measure to assess RO**
 - **Previous measures ask researchers to self-report on Transdisciplinary behavior**
 - Only one end of the “continuum”
 - Issues of “social desirability”
 - Especially in the context of funding agency evaluating a “transdisciplinary” initiative

Sample Items of Research Orientation

Type	Items
UNI	There is so much work to be done within my field that I feel it is important to focus my research efforts with others in my own discipline.
MULTI	While working on a research project within my discipline, I sometimes feel it is important to seek the perspective of other disciplines when trying to answer particular parts of my research question.
INTER/ TRANS	In my own work, I typically incorporate perspectives from disciplinary orientations that are different from my own.
TRANS	In my collaborations with others I integrate theories and models from different disciplines.

Items rated on a 5-Point Likert Scale: Strongly Disagree to Strongly Agree

Test Four Types of Research Orientation

■ Exploratory FA

- Tested 3 and 4 factor models using MLM factor analysis and Principal Axis Factoring methods
 - **4 factors - failed possibly due to:**
 - Too many common factors
 - Sample size too small (n = 54)
 - **3 factors - successfully extracted**
 - Theoretically consistent due to the difficulty in creating distinct inter/ trans items

Confirmatory Factor Analysis Models

Model #	# of Factors	Structure	CFI	SRMR	RMSEA	90% CI of RMSEA	AGFI	NFI
I	2	1: uni	.999	0.065	.001	(0.0 ; 0.070)	0.85	0.82
		2: MIT						
II	3	1: uni	.999	0.056	.001	(0.0 ; 0.053)	0.87	0.87
		2: multi						
		3: inter/ trans						

Scale Reliability and Correlation Matrix for 3 Factors

Factor	Cronbach's Alpha
Uni	0.638
Multi	0.758
Inter/trans	0.709

Factors	Correlation
Uni to Multi	-0.86
Uni to Inter/trans	-0.57
Multi to Inter/trans	0.68

Links: Baseline Survey Dimensions

- **History of Collaboration**
 - Collaborators, inter/trans projects/centers
- **Research Orientation**
- **Semantic Differential**
 - Ratings of affective experiences
- **Fields of Training**
- **Training**
 - Attitudes, Activities
- **Collaborative Resources**
 - Institutional resources
 - Collaborative attitudes
- **Collaborative Processes**
 - Collaborative productivity, interpersonal collaboration
- **Collaborative Activities**
 - TREC, general

ROS & Baseline Survey Dimensions

- **Those who rank higher on the uni-disciplinarity factor**
 - Engage in less “general” collaborative activities ($r=-.353$).
 - Have fewer collaborators ($r=-.364$).
 - Feel CD are less effective in promoting collaboration and trust ($r=-.230$).
- **Those who rank higher on the multi-factor**
 - Engage in more “general” ($r=.518$) and “TREC” ($r=.318$) collaborative activities.
 - Have more collaborators ($r=.361$).
 - Feel that collaborative productivity at their center are better ($r=.298$).
 - Feel they had more institutional resources ($r=.358$).
- **Those who rank higher on the inter/trans-factor**
 - Engage in more “general” ($r=.446$) and “TREC” ($r=.339$) collaborative activities.

Examples of Relationships Between Collaborative Readiness Factors and Other Survey Dimensions

■ Caveats

- Exploratory
- Small sample size

History of Inter/Trans Centers

- **The greater the number of years a researcher was involved in inter/trans centers**
 - The poorer they felt the collaborative productivity ($r=-.400$) and interpersonal collaboration ($r=-.250$) was within their center or with respect to center-related research.
 - The more negative their impression of their center and as a member of TREC ($r=-.402$).
 - The less likely they were to believe that year 1 deliverables would be completed on time ($r=-.303$).
 - **The less they agreed that...**
 - That center members have a high level of mutual trust ($r=-.320$)
 - That the CD is effective in promoting collaboration and trust ($r=-.281$)
 - That the members are socially cohesive ($r=-.270$)

Possible Interpretations

- Many years of inter/trans experiences results in the researcher being
 - Worn-down
 - Struggled in the past to create interpersonal, physical and funding infrastructure and resources. Such effort can take a large amount of time and energy.
 - Realistic
 - Understands the difficulty of TD collaboration and anticipants “real” challenges. No longer possesses naïve optimism.
 - Critical / discerning of TREC
 - Identifies something specific with TREC center/projects/members that indicates this TD endeavor may prove to be particularly difficult.
- Caveats
 - Exploratory
 - Can not answer these questions, but questions raised are worth exploring more in future research

Links: Institutional Resources

- The better the researcher felt their center's institutional resources were
 - The more
 - Positive their impressions of the center and as a TREC member ($r=.311$)
 - Satisfied they were with previous collaborators ($r=.340$)
 - Confident they were that their TREC center would achieve TD research ($r=.397$) and training ($r=.298$) goals
 - The more they felt
 - The members of their center are a socially cohesive group ($r=.275$)
 - Their CD is effective at promoting collaboration and trust ($r=.306$)
 - The better they felt
 - The collaborative productivity ($r=.495$) and interpersonal collaboration ($r=.497$) was within their center or with respect to center-related research

Possible Interpretations

- Institutional resources provides a foundation for researchers and frees them to focus on the challenges of the scientific inquiry and training.
- Without having to compete for scarce resources, it is easier to feel trust and cohesion among members and towards the center director.
- Greater trust leads to greater likelihood of engaging in collaboration with others, including those outside their discipline.

Conceptual Model for Evaluating Collaborative Initiatives

Near Term Markers / Outcomes **Intermediate Markers / Outcomes** **Long Term Markers / Outcomes**

ANTECEDENTS

COLLABORATIVE READINESS

PROCESSES

OUTCOMES

HEALTH IMPACTS

PRIOR TO INITIATIVE **YEAR 1** **YEAR 2** **YEAR 3** **YEAR 4** **YEAR 5** **BEYOND**

Assessment of Written Products

■ Extension of work by Mitrany & Stokols (2005)

- Developed draft measure to examine transdisciplinary integration of dissertation work within School of Social Ecology at UCI

■ Developed protocol to assess TREC developmental proposals

- Each center has \$250,000 per year
- Internal submissions process through steering committee
 - Year 1: 21 proposals

■ Examined collaborative orientation and integrative scope

Development of protocol

■ Two iterations of the protocol

- Independent reviewers, moderator, expert advisors

■ Final protocol criteria

- Listing of centers involved in proposal, researchers and researchers disciplines, department, institution,
- Coding of disciplines by levels of analysis in comprehensive matrix
- Coding of methods of analysis in comprehensive matrix
- Rating of type of cross-disciplinary integration, scope of TD integration, general scope of proposals

Review Process

■ Inter-rater Reliability

- Two independent reviewer ratings
- Correlations ranged from 0.237 to 0.689
 - *What worked?*
 - Reasonable reliability for determining factors such as, the number of levels of analysis, proposal disciplines and general scope of the proposals
 - *What didn't work?*
 - Determining cross-disciplinary integration type

■ Extensive consensus review process

- Consensus scores use for final analysis

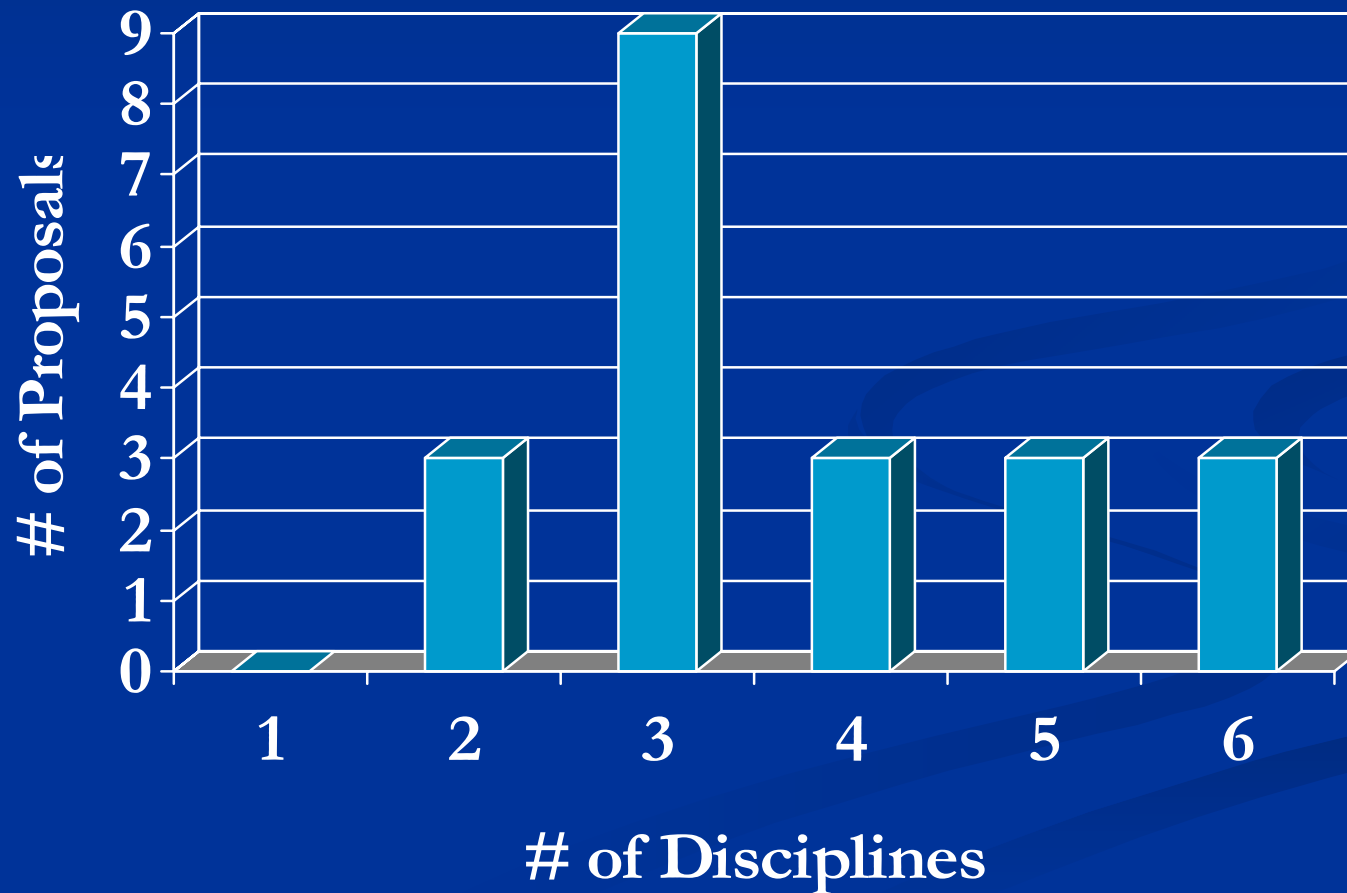
■ Selected results discussed

Cross-disciplinary Representation

More than 35 different disciplines represented across the proposals

Biology	Epidemiology	Neurobiology	Anthropology	Psychology
Chemistry	Geography	Medical Ethics	Neurology	Economics
Physiology & Exercise	Health Behavior & Health Education	Information Technology	Neuro-endocrinology	City, Regional, & Urban Planning
Nursing	Medicine	Bioinformatics	Biostatistics	Nutrition
Education	Biochemistry	Environmental Health	Pharmacology	Sociology
Statistics	Genetics	Metabolomics	Neuroscience	Communications

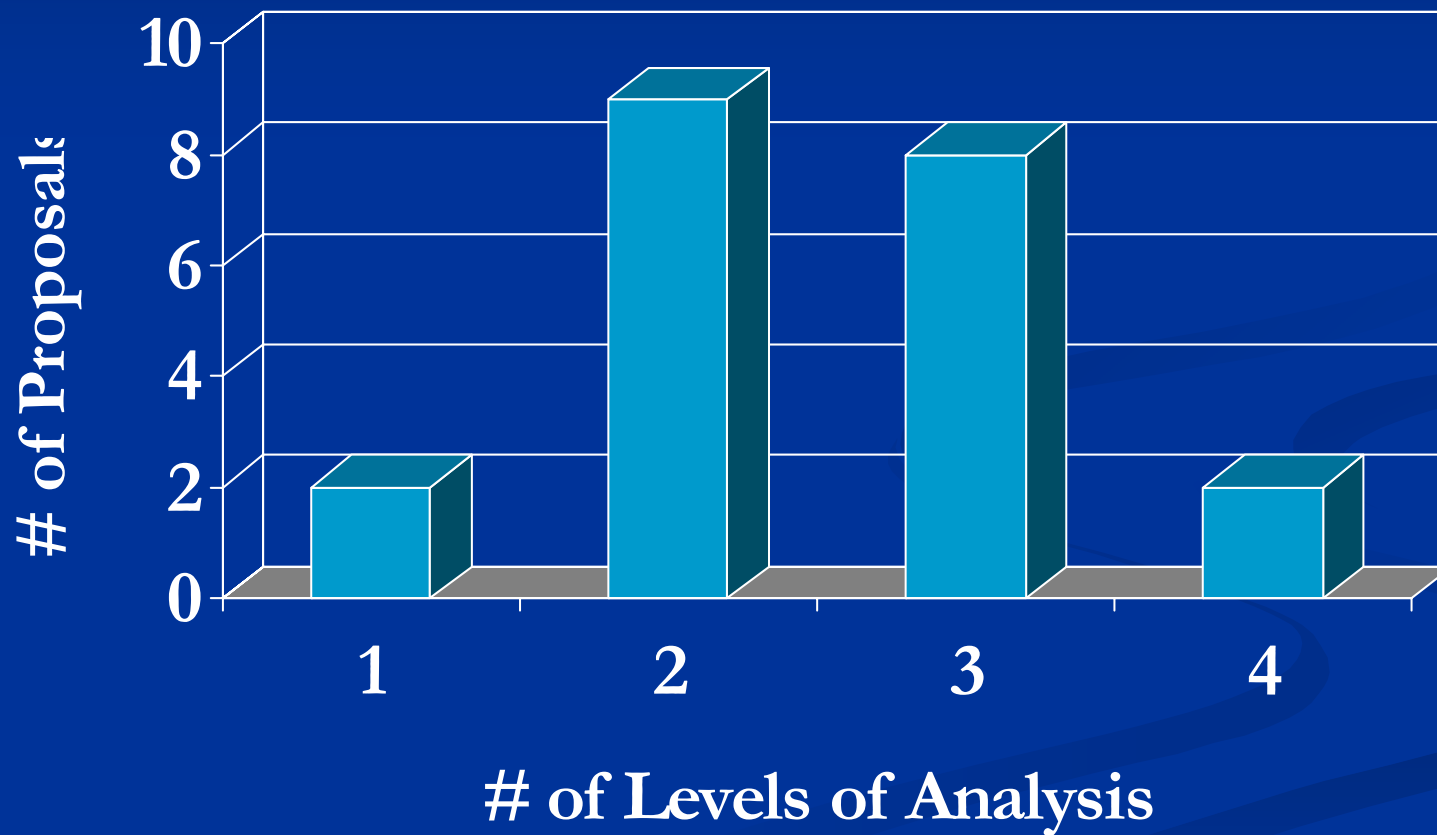
Number of Disciplines Represented within Proposal



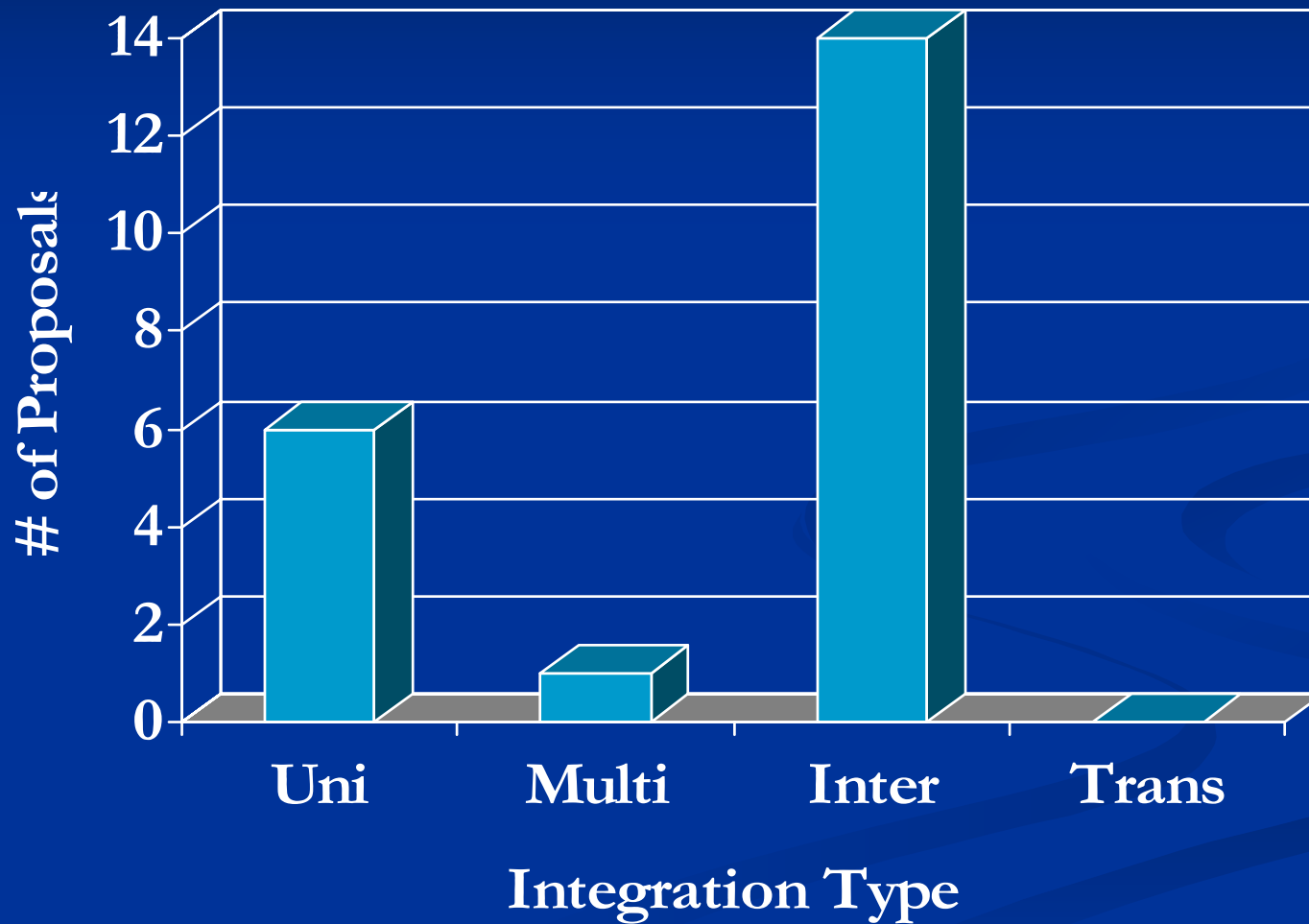
Multi-level Analysis

- 4 of 7 levels of analysis were represented across the proposals:
 - *Molecular & Cellular*
 - *Individual*
 - *Group & Interpersonal*
 - Organizational & Institutional
 - *Community & Regional*
 - Societal & National
 - Global

Number of Levels of Analysis within Proposals



Proposal Integration Type



Cross-Center Collaboration

- No proposals included other center researchers or resources.
- This aspect of the developmental project is currently being facilitated by NCI, the coordination center & the steering committee.
- Assessments of developmental proposals over the remaining four years should demonstrate and increase in cross-center collaboration.

In Sum

- **Extend work from prior initiatives/studies**
 - Conceptually
 - Methodologically
- **Contribute to field of TD Science**
 - New measures and protocols
 - Exploratory data examining empirical links among collaborative readiness dimensions
- **Create cost-effective evaluation strategies**
 - Develop measures protocols that are applicable beyond the current study

Future Directions

- **Further explore this data**
 - Model collaborative readiness factors
 - Do CR factors predict collaborative activities?
 - Link baseline survey with written products assessment
 - Do CR factors relate to proposal characteristics, such as cross-disciplinary integration type or proposal scope?
 - Assess sources of variation among the proposals
 - What would proposals typically show collaboratively?
 - Why some broader than others – are there factors that correlate with breadth of TD Scope?
- **Improve ROS**
 - Increase number of items for ROS
 - Develop “inter” items
 - Test ROS with a more “general” research population
- **Refine research knowledge of Collaborative Readiness factors**
 - Link CR factors to later process and outcome data
 - Identify “high-leverage” determinants of collaboration readiness and capacity
- **Improve Written Products Protocol**
 - Refine criteria to increase reliability of several dimensions
- **Larger samples**
 - Larger initiatives
 - Look across initiatives