

Strategies for Facilitating and Supporting Transdisciplinary Team Science on Cancer: Lessons from the NCI's TREC Initiative

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Presenter Disclosures

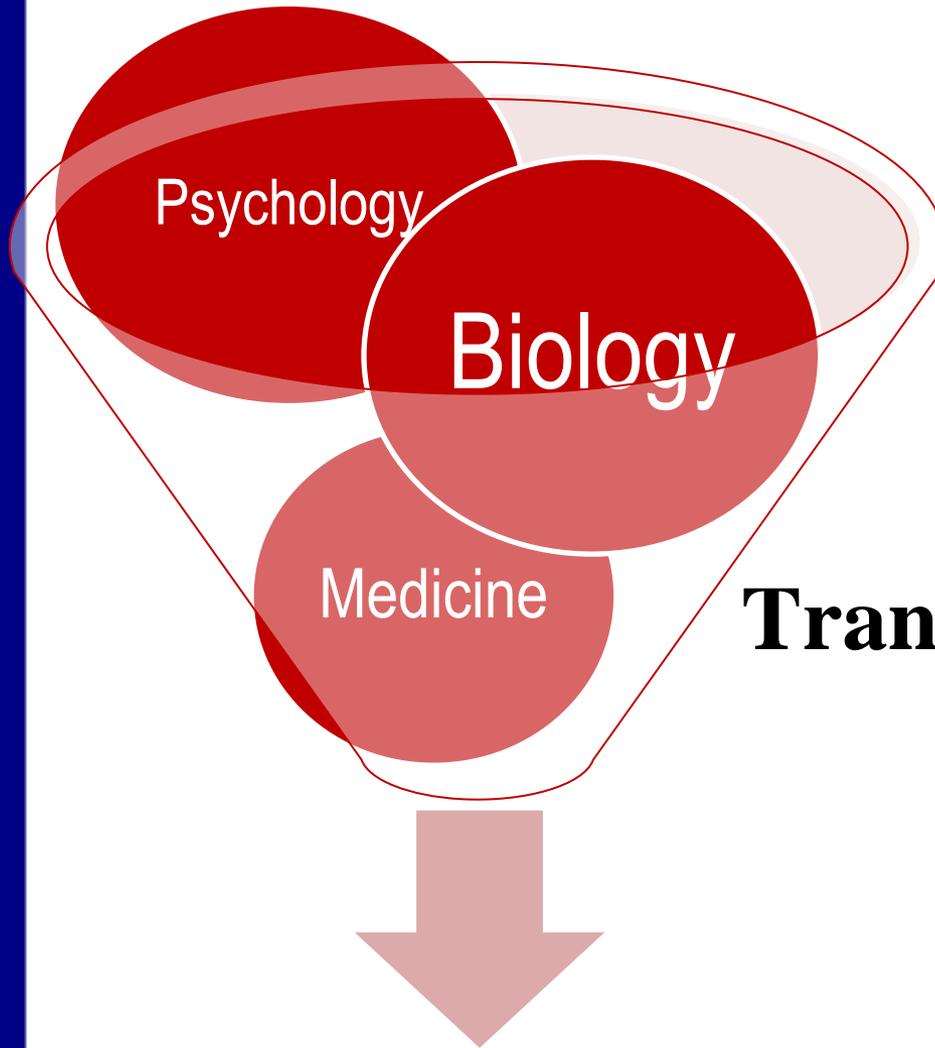
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(1) The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose

Overview

- What is Transdisciplinary Science?
- The TREC Lessons Learned Study
- Selected Findings
- Future Directions/Implications



**What is
Transdisciplinary (TD)
Science?**

A Continuum of Disciplinary Integration

Adapted from Rosenfield, 1992

Transdisciplinary →
Researchers from *different disciplines work jointly* to develop and use a shared conceptual framework that **synthesizes and extends** discipline-specific theories, concepts, and methods, to create ***new approaches*** to address a common problem

Multidisciplinary →
Researchers from *different disciplines work sequentially*, each from their own discipline-specific perspective, with a goal of eventually combining results to address a common problem

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Within

← **Interdisciplinary**

Researchers from *different disciplines work jointly* to address a common problem. Some integration of perspectives occurs, but contributions remain anchored in their own disciplines.

← **Unidisciplinary**

Researchers from a *single discipline* work together to address a common problem

We Have Proposed the Following Definition

TD research and practice is:

“an integrative process whereby **scholars and practitioners from both academic disciplines and non-academic fields work jointly to develop and use novel conceptual and methodological approaches that synthesize and extend discipline-specific perspectives, theories, methods, and translational strategies to yield **innovative solutions to particular scientific and societal problems.**”**

(Stokols, Hall, and Vogel, in press)

Examples of TD Science Funded by NIH

Center Grants

- Clinical and Translational Science Awards (CTSA)
- Transdisciplinary Tobacco Use Research Centers (TTURC)
- Centers for Population Health and Health Disparities (CPHHD)
- Transdisciplinary Research in Energetics and Cancer (TREC)

Meeting Grants

- Scientific Meetings for Creating ID Teams (R13)
- Scientific Meetings for Creating ID Research Teams in Emerging bBSSR (R13)

The TREC Lessons Learned Study



Specific Aims

Document lessons learned about engaging in TD research in a center grant initiative

- Challenges
- Facilitating factors
- Strategies to address challenges

Document broad impact of TD research in a specific area

- Scientific impact (e.g. new analytic models; new applications of methods; novel research findings; emergence of new TD areas of science)
- Impact on participating scientists, trainees, academic institutions (e.g. new collaborations, new areas of research, career advancement, institutional culture change)

Gather recommendations from grantees for enhancing support for TD in future TD center grant initiatives

Transdisciplinary Research in Energetics and Cancer (TREC) Initiative

- **Purpose:** To foster the integration (conceptual, theoretical, methodological) of social, behavioral, and biological sciences to address obesity, physical inactivity, and poor diet within a cancer prevention context.
- 5 year initiative 2005-2010, \$54 million total funding (refunded, with new cohort, 2011-2016, “TREC2”)
- **4 research centers, 1 coordination center**
 - Case Western Reserve University
 - University of Minnesota
 - University of Southern California
 - Fred Hutchinson Cancer Research Center (also served as coordination center)

TREC's Approaches to Foster TD Research

At each center:

- 3 - 5 TD “primary research projects”, each at a different level of science (e.g. public health, clinical, animal model)
- “Cores” to provide integrated support for: biostatistics, TD training

Opportunities for new TD research within /across centers:

- Developmental pilot projects (each one year long)
- Cross-center working groups (e.g. Nutrition Assessment; Molecular Pathways; Physical activity, Sleep, Environmental Measurement)
- Semi-annual all-TREC scientific conferences/meetings
- Coordination center supporting these activities

Methods

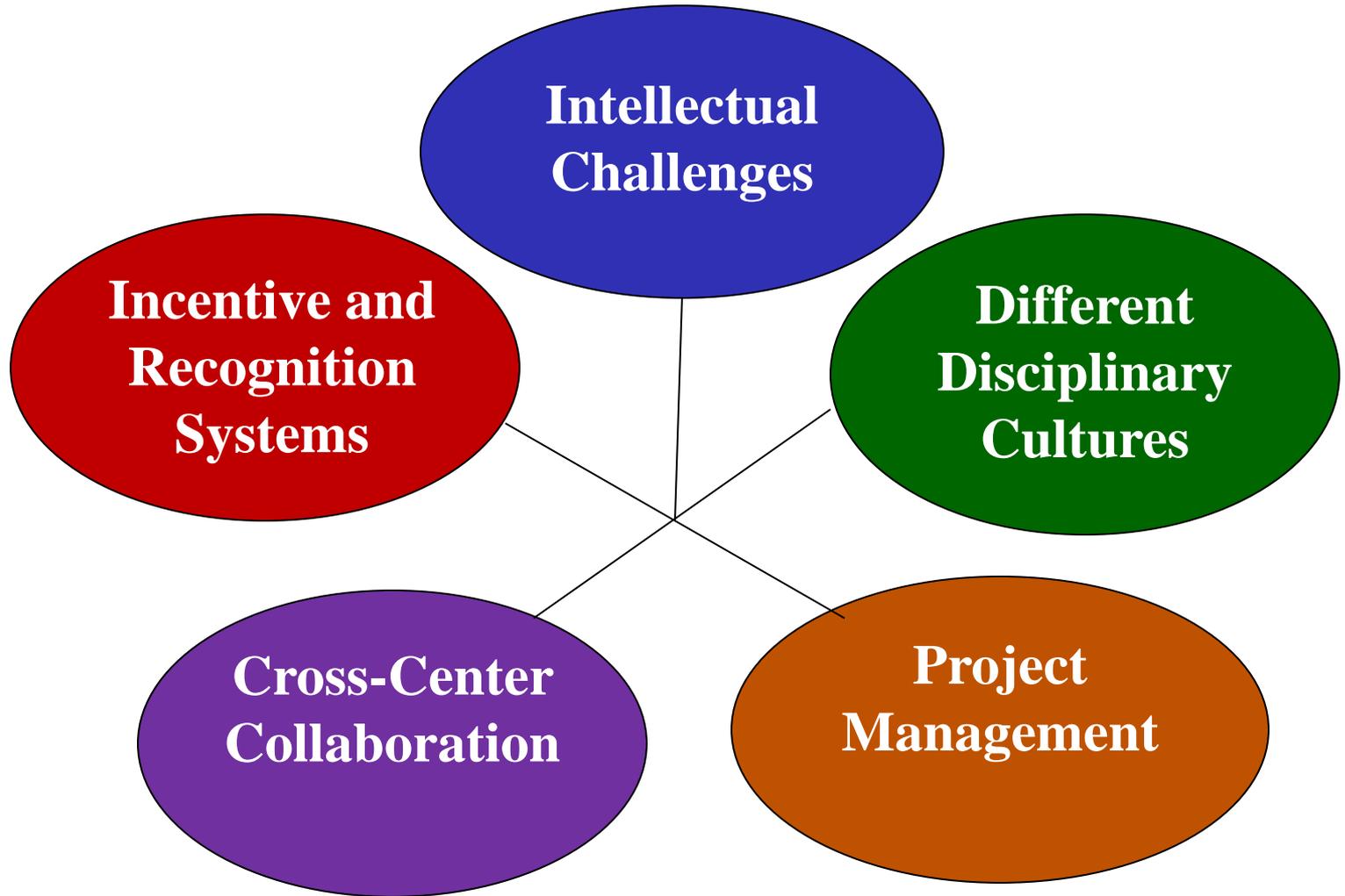
- One-on-one qualitative semi-structured interviews with 31TREC grantees with the following roles --
 - Research Center Directors (n = 4)
 - Primary Research Project PIs (n = 7)
 - Developmental Project PIs (n = 8)
 - Biostatistics Core Staff (n = 4)
 - Training Core Directors (n=3)
 - Trainees (n = 9)
 - Coordination Center Staff (n = 3)*
- Summer 2010, at final TREC scientific meeting and by phone
- Thematic analysis, NVIVO QDM software

*Does not sum to 31 because some individuals held multiple roles

Key Findings



Challenges to TD Research



Intellectual Challenges of TD Research

TD science “stretches” investigators’ intellectual “capacity” more than usual scientific endeavors (more distinct disciplines = more challenging)

- Participants described this work as: “challenging”, “head-scratching”, and “somewhat painful”, though ultimately enriching to the science and the scientist

A lack of clarity about “what TD is”, and “how you get there”

- TREC grantees were TD pioneers – they had limited exposure to prior examples of TD research to serve as models, and there was still debate among scholars about the definition of TD research, creating a lack of clarity

Differences in Disciplinary Cultures

Different disciplinary cultures among collaborators --

- Values - Different epistemological values and assumptions re: what research questions are valued, variables are of interest, methods are legitimate
- Language - Different terminology, or the same terminology with different meanings
- Traditions - Different work styles: team based vs. individual-based research; statistical methods

Team members want to stay in their “comfort zone” with respect to their disciplinary culture

- Concepts, theories, variables, methods, language, work style

Project Management Challenges

TD research can be more complex, time consuming, and expensive than UD research

- May include more staff, more variables, more assays, a larger sample size, multiple endpoints, or a longitudinal design to capture the TD interplay of variables

While a large team of varied collaborators creates more opportunity for innovation, it makes project planning and management more challenging—

- It took longer to create a team and develop a unified vision that integrated all team members' perspectives
- More effort was required to manage the team-based research process
- These activities required more funding

Challenges to Cross -Center TD Collaborations

Standard grant making protocols create barriers

- Require that grant applications describe fully formed within-center research projects (budgets and attention are focused here)
- Cannot know other successful applicants (possible collaborators) until after funded is awarded

Centers want to conduct research in the way(s) they are accustomed to (data management systems, labs)

- The benefits of cross-center collaboration must outweigh the costs of new approaches (learning curve, uncertainty, effort, time, money)

Physical distance created communication challenges

Incentive System Challenges

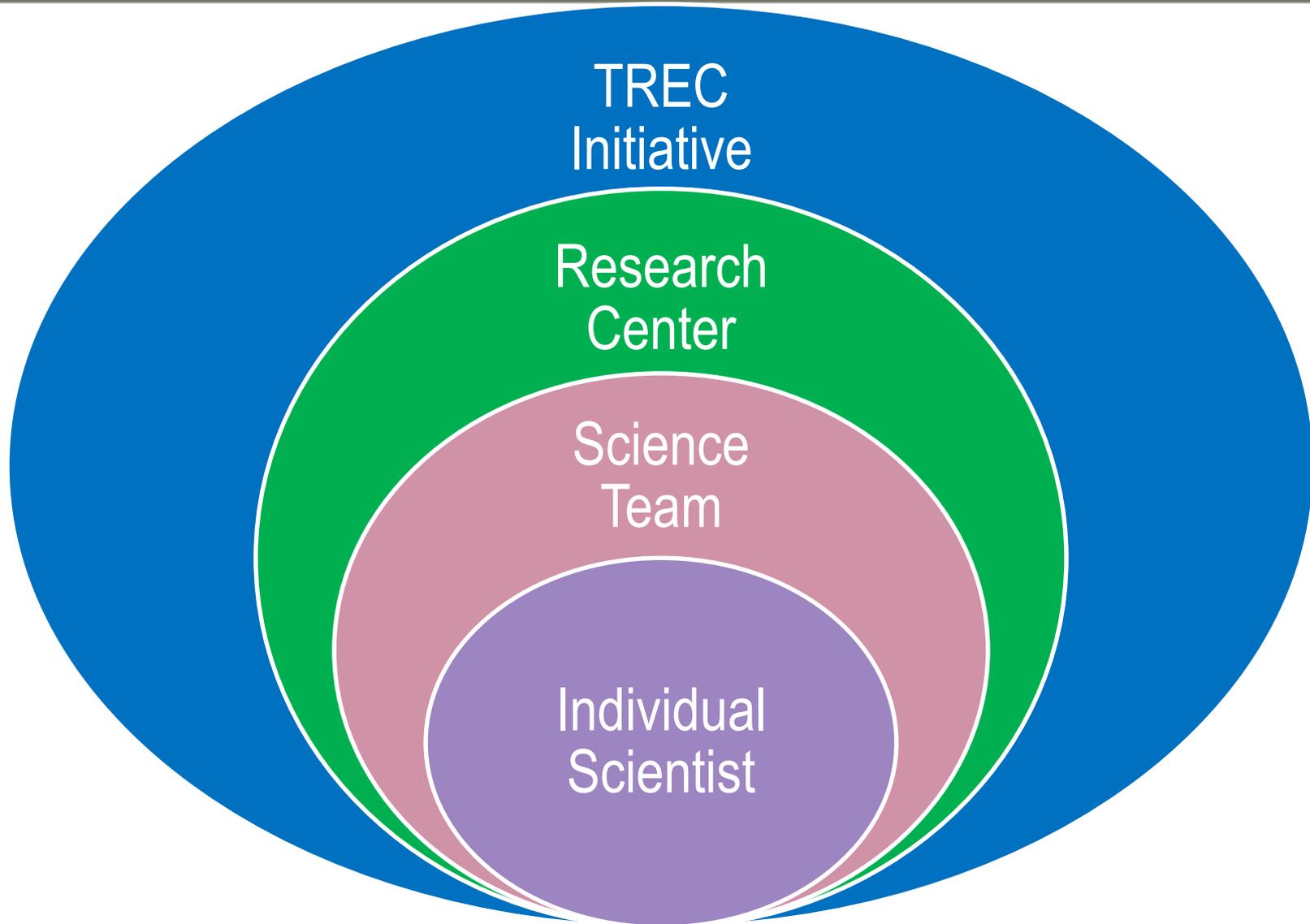
Academic incentives have not yet “caught up” to TD research –

- Lack of systems for cross-school/-department collaborations, and incentives against them
- P&T criteria reward individual UD research, rather than team-based TD research
 - As a result, scientists may prioritize individual projects, be protective of data and funding
- Limited funding opportunities, unclear where to publish TD research

Colleagues may be unfamiliar with TD research --

- IRB reviewers, grant reviewers, article reviewers, others

Facilitating Factors and Strategies to Address Challenges



Facilitating TD Research: Individual Attitudes and Beliefs

- **“Critical awareness” of the strengths and weaknesses of all disciplines**
 - Believing in the added value of TD
- **Believing in the added value of team work**
 - Appreciating other team members’ skills, knowledge, and resources
- **Scientific curiosity paired with an “openness” to exploring new areas of science**
 - Feeling “enriched” and “expanded” by TD research

Facilitating TD Research: Team Processes

- **Building relationships**
 - Developing personal relationships; “chemistry” among collaborators
 - History of positive, effective collaborations
- **Having shared concrete goals**
 - Writing papers and grant applications together
- **Developing mutual understanding**
 - Regular communication (team meetings, calls)
 - Team members teach each other about their disciplines, through formal and informal opportunities

Facilitating TD Research: Center Characteristics

- **Leadership creates environment conducive to TD research**
 - Understands TD approach
 - Champions TD at the institution
 - Obtains resources for TD research
 - Acts as a “matchmaker” for new TD collaborations
 - Provides vision through project management meetings at center level
- **Opportunities for cross-disciplinary networking and learning**
 - Regular center-wide symposia bringing together researchers from all TREC center disciplines
 - Guest speakers with relevance to current research at center
- **Biostatistics core = bridging disciplines**

Facilitating TD Research: Initiative Characteristics

- **Expectations of funding agency**
 - Requirements of initial funding announcement
 - Expectations of NCI staff to achieve TD
- **Support for new TD research collaborations**
 - Semi-annual scientific meetings and conferences
 - Developmental Pilot Projects (DPPs)
 - Cross-center Working Groups
- **Funds to support trainees (DPPs, additional training funds)**
 - Trainees drove a great deal of new TD research

Future Directions/Implications

Future Directions/Implications

Training can help address intellectual and disciplinary challenges –

- Scientific skills *and* attitudes for team-based TD research
- For investigators at all career stages
- www.teamscience.net

Dissemination of Best Practices –

- For scientists: “How-to’s” for TD research; examples of exceptional TD research initiatives
- For academic institutions, funders, IRBs, journals: Best policies and procedures to support TD research
- www.teamsciencetoolkit.cancer.gov

Future Directions and Implications for Center Grants

Earmarking funds for new TD research collaborations is highly effective

- DPPs, working groups, and semi-annual scientific meetings effective to support new TD research

Additional strategies are needed to overcome challenges to cross-institutional collaboration

- In TREC 2, all DPPs must focus on 1 of 3 topic areas, incentivizing more cross-center work
- Infrastructure to foster shared vision across centers

Coordination center can support these activities

Funding for trainees is an important investment

Related Resources

NCI Science of Team Science (SciTS) Research:

<http://cancercontrol.cancer.gov/brp/scienceteam/index.html>

http://cancercontrol.cancer.gov/brp/presentations_day1.html

TREC Initiative:

www.trecscience.org

Team Science Toolkit:

www.teamsciencetoolkit.cancer.gov

Discussion

- **Questions?**
- **Comments?**



Contact information:

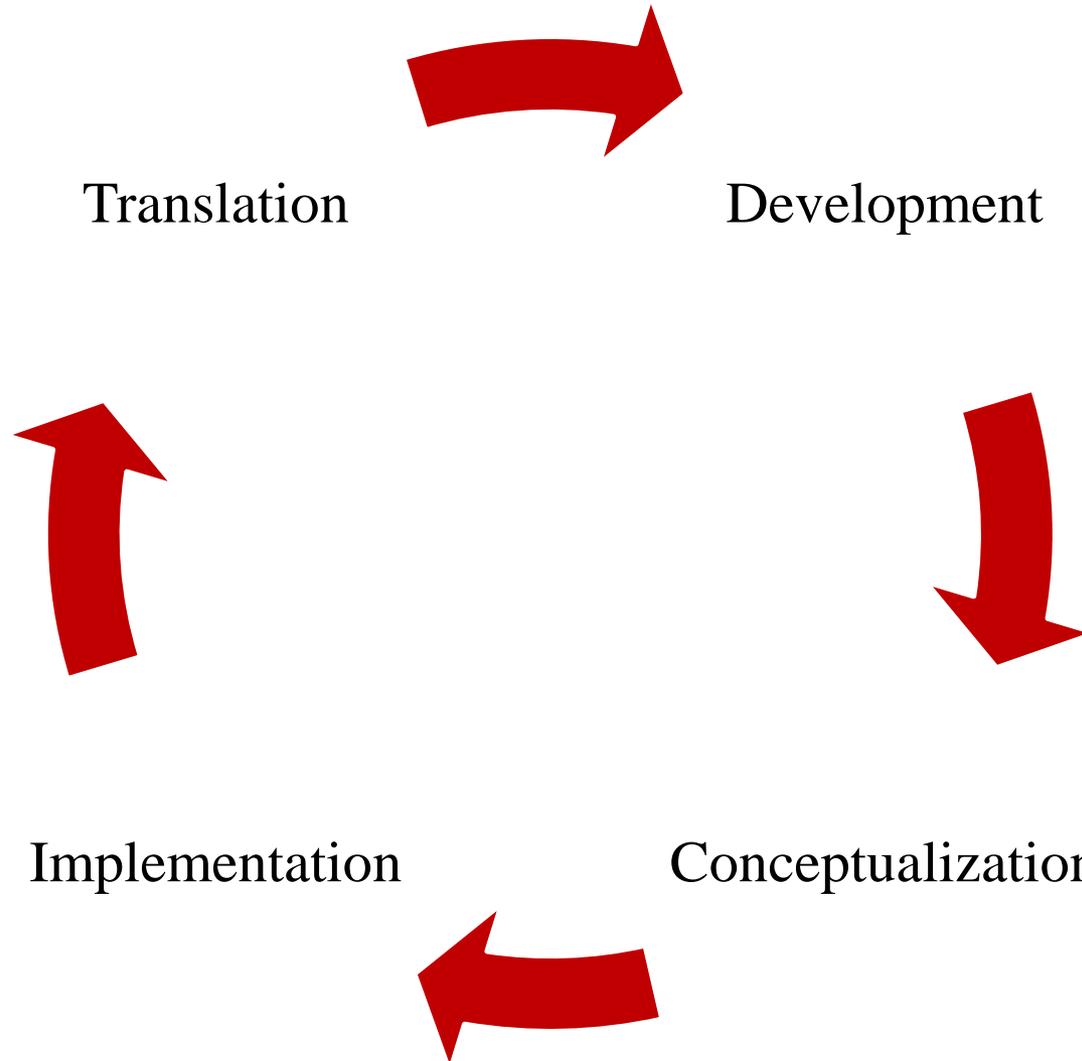
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Thank you

Extra slides follow

Four Phases of a TD Initiative



(Stokols, Hall, and Vogel, in press)

Limitations

- **Interviews conducted by members of team housed within funding agency (NCI)**
 - May have led grantees to (incorrectly) perceive the evaluation as impacting funding/renewal, leading to reporting bias
- **Qualitative research findings may not be generalizable**
 - To other participants in TREC, other grant initiatives