Translational Environmental Research: Improving the Usefulness and Usability of Research Results

Progress and Challenges in Bridging the Gap Between Science and Decision Making

2008 AGU Fall Meeting, San Francisco, CA

Gregg Garfin
Deputy Director for Science Translation and Outreach
Translational Research

- Definition
- Medical and health sciences
- Environmental sciences
  - Extension – diffusion of innovation
  - RISA – multidisciplinary end-to-end
  - NSF DMUU – discussion support
- Impediments
- Commonalities
Translational Research

- Harnessing basic science insights and translating them to decision-making contexts
- End-to-end research
  - Parallel research, prediction and application
  - Non-linear
  - Integrated and overlapping expertise
- Goal:
  - Improve the basis for making decisions
3T’s Health Care System Road Map

- Basic biomedical science → T1 → Clinical efficacy knowledge → T2 → Clinical effectiveness knowledge → T3 → Improved health care quality and value and population health

T1: Key T1 activities to test what care works
- Clinical efficacy research
- Clinical efficacy research
- Comparative effectiveness research
- Health services research

T2: Key T2 activities to test who benefits from promising care
- Outcomes research
- Comparative effectiveness research

T3: Key T3 activities to test how to deliver high-quality care reliably and in all settings
- Measurement and accountability of health care quality and cost
- Implementation of interventions and health care system redesign
- Scaling and spread of effective interventions
- Research in above domains

3T’s Health Care System
Road Map

Efficacy

Clinical efficacy research

Key T1 activity to test what care works

Effectiveness

Outcomes research
Comparative effectiveness research
Health services research

Key T2 activities to test who benefits from promising care

Reliability

Measuring health care quality and cost
Implementation of interventions and health care system redesign
Scaling and spread of effective interventions
Research in above domains

Key T3 activities to test how to deliver high-quality care

Improved health care quality and value and population health

3T’s Health Care System
Road Map

Basic biomedical science → T1 → Clinical efficacy knowledge → T2 → Clinical effectiveness knowledge → T3 → Improved health care quality and value and population health

Key T1 activity to test what care works
Clinical efficacy research

Key T2 activities to test who benefits from promising care
Outcomes research
Comparative effectiveness research
Health services research

Key T3 activities to test how to deliver high-quality care reliably and in all settings
Measurement and accountability of health care quality and cost
Implementation of interventions and health care system redesign
Scaling and spread of effective interventions
Research in above domains

Occasional spectacular breakthrough
Delivery of existing treatments
Tools, learning networks, how knowledge is transferred

3T’s Health Care System Road Map

Basic biomedical science → T1 → Clinical efficacy knowledge → T2 → Clinical effectiveness knowledge → T3 → Improved health care quality and value and population health

T1: Key T1 activity to test what care works
Clinical efficacy research

T2: Key T2 activities to test who benefits from promising care
Outcomes research
Comparative effectiveness research
Health services research

T3: Key T3 activities to test how to deliver high-quality care reliably and in all settings
Measurement and accountability of health care quality and cost
Implementation of interventions and health care system redesign
Scaling and spread of effective interventions
Research in above domains

Funding: 98.5%
Technically sexy

Translational Knowledge Transfer – The Promise

• Exchange
  – End users play a more prominent role
  – Co-develop research priorities
  – Engage in funding process
  – Multi-directional communication
  – Honor existing pathways and contexts (culture)

Lavis, 2006 – J. Continuing Educ. in the Health Professions
Translational Knowledge Transfer – The Impediments

- Fragmentation
  - Incompatible databases
  - Lack of qualified researchers
  - Inadequate funding
  - Uni-directional → T1 Push
  - High research costs
  - Career disincentives

Lavis, 2006 – J. Continuing Educ. in the Health Professions
Cooperative Extension

- Research and application of information related to agriculture
- Collaboration between USDA and land-grant colleges
- Boundary organization (Guston, 1999; 2001)
  - Science and policy (Cash, 2001)
Diffusion of Innovations

- Diffusion (of innovations) is the process by which an innovation is communicated through certain channels over time among the members of a social system.
- 5 stages: awareness, persuasion, decision, implementation, and adoption.
- If the innovation is adopted, it spreads via various communication channels.
- Finally, social systems determine diffusion, norms on diffusion, roles of opinion leaders and change agents, types of innovation decisions, and innovation consequences.

Rogers, 1995
Improve link between climate sciences and society

- Services
- Forecasts

http://www.climate.noaa.gov/cpo_pa/risa/
RISA Participatory Assessments Frame

A. Situation Assessments:
   Participants
   Activities
   Needs
   Resources/Capacity

B. Range of scientific knowledge frames:
   predictive capabilities
   uncertainty, ignorance/
   indeterminacy

C. Policy contexts and decision-making processes

D. Dynamic dialogue between researchers (non-decisive) and practitioners (decisive) on problem-definition:
   shared understanding of significance and value conflicts

Pulwarty et al., 2009
RISA

- Problems designate theory
- Regions: nexus of local-to-global
  - Partnerships, infrastructure
- Link assessments and impacts to emergent problems and long-term vulnerabilities
  - Focusing events
- Multiple stressors
- Partnerships must be sustained – iterative
- Mutual learning, dialogue, integrated

Pulwarty et al., 2009
DCDC Elements

• Hydroclimate studies
• Vulnerability studies
• Decision research studies
  – Perceptions
• Visualization studies
• Education (K-12) and Training
• Outreach, Community Partners, Exchanges

Decision Center for a Desert City – http://dcdc.asu.edu
WaterSim in the Decision Theater

Decision Theater: Focus Groups are held in the theater.
Each participant sits at the table facing the screens with a laptop.

Gober, 2008 – DMUU Briefing
Shortcomings

• Inadequate financial support
  – Especially: IT, Visualization, Training, Usability
• Shortage of translational investigators
• Impediments in the academic culture to collaboration, rewards
• Lack of structured evaluation
Evaluation

• Degree of collaboration
  – Partnerships
• Quality and relevance of research to stakeholders and researchers
• Quality and relevance of decision support and decision tools
• Evidence of impact or planning and decision making (by users)

Miles et al., 2006 – PNAS
Characteristics of Success

• Mixed portfolio
• Supply and demand → iteration
  – Single interventions do not solve problems
• Co-production leads to adoption
  – Opinion leaders and early adopters
  – Embedding and exchange
• Long-term investment: capacity building
  – Ongoing communication between producers and users of information → salience, etc.
Gregg Garfin
Climate Assessment for the Southwest
Institute for Environment and Society
gmgarfin@email.arizona.edu
520-622-9016
www.ispe.arizona.edu