Health Care Quality Improvement Research: Theory and Its Application in Statistical Analysis

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Research

Systematic investigation designed to develop or contribute to generalizable knowledge

--DHHS
QI Research

Systematic investigation designed to develop or contribute to generalizable knowledge about the impact or methods of QI
Knowledge

• Epistemology
• True, justifiable belief
• True, justifiable belief
  – In a world in which knowledge changes...
    • Belief, reasonably justified by evidence
Karl Popper*: Inductive Reasoning

- Easy to obtain confirmations for nearly every theory — if we look for confirmations.
- Confirming evidence should not count except when it is the result of a genuine test of the theory; [by] a serious but unsuccessful attempt to falsify the theory. (I now speak in such cases of “corroborating evidence.”)
- Criterion of the scientific status of a theory is its falsifiability, or refutability, or testability
- Irrefutability is not a virtue... but a vice.

*1963
Using a logic model to describe theory
Logic Model

- Explicit representation
- Organizes ideas, activities, and measurement into one or a few pages
- Synthetic and analytical in nature
- Can support program design and evaluation
Logic Model

Adapted from Paul F. McCawley, Associate Director University of Idaho Extension from Taylor-Powell, E. 1999. & Providing leadership for program evaluation. University of Wisconsin Extension, Madison.
Conceptual Framework

• Links inputs, outputs, and outcomes within a theoretical construct: the big view
• Postulates pathway or mechanism of action sufficiently to allow for program development
• Suggests leverage points for program and metrics
Theory of Change

• Articulates how what you are planning is (in theory) going to move you closer to your goal
Theory of Change

• How do you expect inputs to produce outputs?
• How do you expect outputs to produce outcomes?
• How does external context enable or hinder these processes?
Apply conceptual model

- Create operational program
  - Specifies available inputs, outputs that represent key processes, and outcomes or goals
  - Consistent with your conceptual framework
Why does this matter?

- QI research seeks to produce generalizable knowledge.
- QI programs and interventions depend upon complex social science theories.
- Generalizable knowledge requires understanding intervention, context and interrelationships.
World as we wish it were

Problem

Intervention

Fixed (no side effects)

Simple change has desired effect and only desired effect
World As It Is

Macro Diagram of the Actions of Quality Health Care

ENTER SYSTEM | ASSESSMENT (decision making) | MANAGEMENT

- PROVIDER AWARENESS
  - ACCESS TO INDIVIDUAL OR FAMILY
  - RECOGNIZE CONCERN, NEED, OR OPPORTUNITY
  - ASSESS NEED OR OPPORTUNITY
  - DIAGNOSE
  - DEPENDENT CARE MANAGEMENT PLAN
  - EXECUTE CARE MANAGEMENT PLAN
  - REFERAL

- INDIVIDUAL AWARENESS
  - ACCESS TO SYSTEM
  - NO CARE NEEDED

REASSESS

Routine Follow Up

Complex system with complex effects of even simple changes
World as we wish it were

Changes in structure lead to predictable changes in process lead to predictable changes in outcomes
World As It Is

Complex and mediated relationships
TOC and Analysis Plan

• Articulating Mechanism of Action:
  – Identifies metrics to serve as markers along the path of change
  – Predicts whether key variables fill a gap (additive), change how things work (multiplicative), or both

• Build appropriate analytical model
  – Interactions
  – Stratified Analysis
Potential Intervention Targets (Levels)

• System change
  – Target fundamental structure or process
• Population
  – Target broadly defined population
• Organization
  – Overall performance of an organization
• Practice
  – Unit or practice within larger organization
Examples of Social Theories*

- **Individual Behavior**
  - Health Belief Model
  - Reasoned Action
  - Stages of Change

- **Group Behavior**
  - Social Networks

- **Group/Community**
  - Engagement/CBPR
  - Diffusion of Innovation
  - Natural Helper Theories
  - Media Studies

- **Integrating**
  - PRECEDE-PROCEED
  - Social Marketing
  - Ecological Models
  - Social Capital

*after Glanz et al, 2003 & DiClemente et al, 2002
Example

• Situation: Young Adults have highest rates of uninsurance
  – 19-29: 3x higher than < 18

• Why? Perhaps,
  – Age out of eligibility
    • Medicaid and parents’ private plans
  – Don’t perceive risk (Health Belief Model)
  – Entry level jobs don’t provide insurance
    (HBM, ↑ barriers => ↓ insurance => ↓ well PEs)
Baseline

Organizational / Environmental Context

Situation

Inputs
Medicaid < 18
Parents’ insurance until 18
Students
Hi % Entry Workers

Outputs
High Un-insurance

Impacts

Goals
Short
Med.
Long

↑insurancex
Better health care
Better health
Theory of Change*

- Target System level
  - New law mandating eligibility of young adults on their parents’ private health insurance plans
Findings*

• Insurance rates increased very slightly, 0.2%

• Percent who had had a recent check up went up 20 fold more (~4 %)

Findings caused re-consideration of the theory of change

* Blum et al
TOC Revisited

- Law
- ↑ Insurance
- ↑ Access

- Uninsured
  - Become
  - Insured

- Underinsured
  - get better
  - insurance
After Study

Still unstudied: how did external context influence either implementation or outcomes
What makes a logic model useful?

- Summarizes what the program needs, has, and will do and points to metrics
- Explicitly illustrates what you hope/plan to do
- Incorporates conceptual context and TOC
- Guides analysis and interpretation
Building a logic model and a program

What Do We Measure?

What do we have?
What can we produce?
What are our goals?

What do we need?
How would it work?
How does it get us to our goals?

Inputs → Outputs → Outcomes

IMPACT of CONTEXT / ISSUES of HETEROGENEITY
Setting Up the Analysis

• Framing the right research question
  – What are the active ingredients in the intervention
  – What are the relevant aspects of the context?
    • Receptor sites
    • Resources

• Distinguish between additive and multiplicative relationships in the theory
Develop Analytical Model*

- With multiplicative and additive relationships as determined by theory
- Consider Regression Risk Analysis
  - Adjusted Risk Ratio
  - Adjusted Risk Differences

* Kleinman & Norton, *HSR* 2008
Cycle of Learning and Planning

- Conceptual Framework
- Contextualized Logic Model w TOC
- Evaluate
- Program Design & Implementation
- Review Resources and Plan
- Ideas for Program
Charge:

Based upon the following parameters, use your knowledge and understanding to articulate a goal and develop a theory, theory-based intervention and analysis plan.

Make the implicit explicit
Include a TOC and be explicit about what models or theories you used to derive your intervention and TOC
Case 1

• Context:
  – Inner City Children’s Hospital in a Hospital
  – Electronic Health Record

• Situation:
  – Chart audit finds that 1/3 of white children and 1/2 of non-white children who are behind on immunizations and when seen in any outpatient facility do not receive their needed vaccination

• Perspective:
  – Hospital quality perspective
Case 2

• Context: Six site large pediatric practice with diverse patient mix, about 40% Medicaid and 15% HMO in a 2 county area that includes both city and rural demographics

• Situation: Medicaid report indicates 40% year to year increase in asthma patients visiting ED. HMO shows 15% increase

• Perspective: Choose between clinical perspective and population perspective