Supporting policy and practice: Why systematic reviews matter

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Why we care about evidence

- Good intentions are not enough
  - Can have unintended, even harmful effects
- Building knowledge to inform policy and practice
A Classical Definition of Knowledge

According to Szczepan, 1990, the classical definition of knowledge involves the process of building knowledge. In the information age, there is a great need for syntheses/summaries of relevant evidence. Lipsey, 1997, notes that “What can you build with thousands of bricks?” Combining results of studies “can lead to the building of better intervention theories needed to guide effective program development and evaluation design”.

Building knowledge

- In the information age there is great need for syntheses/summaries of relevant evidence.
- “What can you build with thousands of bricks?” (Lipsey, 1997)
- Combining results of studies “can lead to the building of better intervention theories needed to guide effective program development and evaluation design”.
What can we build?

How do we build evidence?

- What are our blueprints?
- What are the raw materials?
- What methods are used to combine results across studies?
Blueprints

- Plans for review
- Reviews vary in amount of planning, transparency, rigor
  - Traditional, narrative reviews
  - Systematic reviews
    - Cochrane/Campbell systematic reviews

Traditional reviews

- Convenience samples of published studies
- Narrative description of studies
- Cognitive algebra or “vote counting” to synthesize results
  - Relies on statistical significance in primary studies, which may be “underpowered” (too small or too weak to detect effects)
- Vulnerable to bias
Bias

- Bias is a distortion of information
- Bias can lead to the wrong conclusions
- Several known sources of bias affect research reviews

Publication bias

- Studies with statistically significant results are more likely to be published than studies with non-significant (null) results
  - (Begg, 1994; Dickersin, 2005; Scherer et al., 2004)
- Sources of publication bias are complex
Outcome reporting bias

- Within studies with mixed results, significant results are more likely to be
  - reported (mentioned at all)
  - fully reported (i.e., data provided)
- (Chan et al., 2004, 2005; Williamson et al., 2006)

Confirmation bias

- Tendency to seek and accept information that confirms prior expectations (hypotheses) and ignore evidence to the contrary
  - (Bacon 1621/1960, Watson 1960, 1968; Mahoney, 1977; Fugelsang et al., 1994; Nickerson, 1998; Schrag, 1999)

- Murphy’s Law of Research
  - If you look hard enough, you will find evidence that supports your theory
Summary: Bias

- Publication and reporting biases appear to be cumulative (Altman, 2006)
  - Tend to inflate estimates of effects
- Problems are ubiquitous, but often ignored

How do we minimize bias?

- Systematic reviews are a form of research
  - Aim to minimize bias at each step
  - Follow pre-determined plan (protocol)
  - Use transparent (well-documented, replicable) procedures to locate, analyze, and synthesize results of previous studies
Quality of raw materials matters

- High quality materials (studies) needed to produce a strong, reliable product
- “Best” materials depend what we are building

What are studies made of?
A simple example

- Starting with 30 bricks

An Example

Parent Training vs Multisystemic Therapy (Brunk et al., 1987)

- 43 families of abused/neglected children randomly assigned to
- Parent training (PT) groups or Multisystemic Therapy (MST)
- 33/43 families completed treatment and provided data on outcomes immediately after treatment
- 30 outcomes (scales and subscales)
Results expected by chance (30 outcomes)

1 favor PT
1 favor MST
28 no difference

Results obtained (Brunk et al., 1987)

Parent Training vs Multisystemic Therapy
Results obtained (Brunk et al., 1987)
Parent Training vs Multisystemic Therapy

What did the investigators make of these results?
Data provided on all (7) statistically significant results. 12/22 non-significant results. Outcome reporting bias.

Both groups showed decreased psychiatric symptoms, reduced stress, and reduced severity of identified problems. MST was more effective than PT at restructuring parent-child relations. PT was more effective than MST at reducing identified social problems.
What did the investigators build?

A balanced report
(with some missing data)

What did published reviews build?

“Parents in both groups reported decreases in psychiatric [symptoms] and reduced overall stress....both groups demonstrated decreases in the severity of the identified problems....[MST] improved [parent-child] interactions, implying a decreased risk for maltreatment of children in the MST condition” (p. 293).
What did published reviews build?


MST “improved parent-child relations”

Outcome data
What did published reviews build?


Average ES across all outcomes
\[ d = 1.32 \text{ (sd=0.65)} \]

Average MST case outperformed 90% of PT cases on average across all outcomes??

Outcome data

Summary: Published reviews describing Brunk et al.

<table>
<thead>
<tr>
<th>Text</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns et al (2000)</td>
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<td>Corcoran (2000)</td>
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<td>Curtis et al (2004)</td>
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<td>Henggeler, Lee (2003)</td>
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Outcome data
Most reviews used a single phrase to characterize results of this study, highlighting advantages of one group (MST).

Loosing information on:
- relative advantages and disadvantages of different approaches
- equivalence of different interventions

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86+ reviews of research on effects of MST published after 1996:
- more reviews than studies!
- Assessed 66 reviews
- Most were “lite” reviews (relied on other reviews)

37 reviews cited one or more primary studies:
- Analysis of review methods (Littell, 2008)
- Most were traditional narrative summaries of convenience samples of published reports
- Most conclude that MST “works” (is more effective than alternatives)
“The efficacy of MST... was established through three randomized clinical trials with delinquents, and effectiveness through the transfer of MST to other clinical populations ... and to multiple organizational settings" (Burns et al., 2000, 309).

“MST is unique... providing multiple replications across problems, therapists, and settings.... This shows that the treatment and methods of decision making can be extended and that the treatment effects are reliable.... MST is quite promising given the quality of evidence and consistency of the outcomes” (Kazdin & Weisz, 1998, 28).

Campbell/Cochrane review

- Effects of Multisystemic Therapy (Littell, Popa, Forsythe, 2005)
- Are not consistent within or across studies
  - Few studies
  - All studies have mixed results across outcomes (except those that have null results)
Systematic review

- Family cohesion

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Treatment Mean</th>
<th>SD</th>
<th>Control Mean</th>
<th>SD</th>
<th>Std. Mean Difference</th>
<th>IV, Random, 95% CI</th>
<th>Heterogeneity: Not applicable</th>
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<td>32.05</td>
<td>8.86</td>
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<td>10.15</td>
<td>7.06</td>
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Mean |

| 32.05 |
| 32.55 |
| 32.5 |
| 32.5 |
| 32.55 |
| 32.5 |
| 32.5 |

SD |

| 8.86 |
| 0.88 |
| 1.86 |
| 0.88 |
| 0.88 |
| 0.88 |
| 0.88 |

Total |

| 80 |
| 80 |
| 80 |
| 80 |
| 80 |
| 80 |
| 80 |

Issues

- The science and practice of research synthesis are not well-connected (Littell, 2005, 2008)
  - “Science is supposed to be cumulative, but scientists only rarely cumulate evidence scientifically” (Chalmers, Hedges & Cooper, 2002)
- Scientists urge policy makers and practitioners to pay attention to “scientific” evidence... shouldn’t scientists do the same?
  - Shouldn’t evidence be cumulated scientifically?
The Scope of Systematic Reviews

- Specific, narrow questions
  - Few studies, little variation
  - Restricted domain for generalization
- Broad, global questions
  - More studies, more variation
  - Global, wide domain of generalization
- Lipsey (2008)

The Scope of Systematic Reviews

- Not limited to questions about effects
- Can address trends, epidemiology, accuracy of diagnostic and prognostic tests
- Not limited to randomized controlled trials or quantitative data
Why systematic reviews matter

- Systematic reviews can provide more accurate, reliable syntheses of empirical evidence than traditional reviews
  - Ought to be used to inform policy and practice
  - Can be used to synthesize data on many questions (not just questions about effects)
- Better to have few, rigorous systematic reviews than many (86+) nonsystematic reviews

Evidence for practice and policy: Effectiveness in context

Adapted from: Gibbs (2003), Davies (2004)
Thank you!
Enjoy the Colloquium

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