



# The Science of Behavior Change: From Evidence-Based Practice to Practice-Based Evidence

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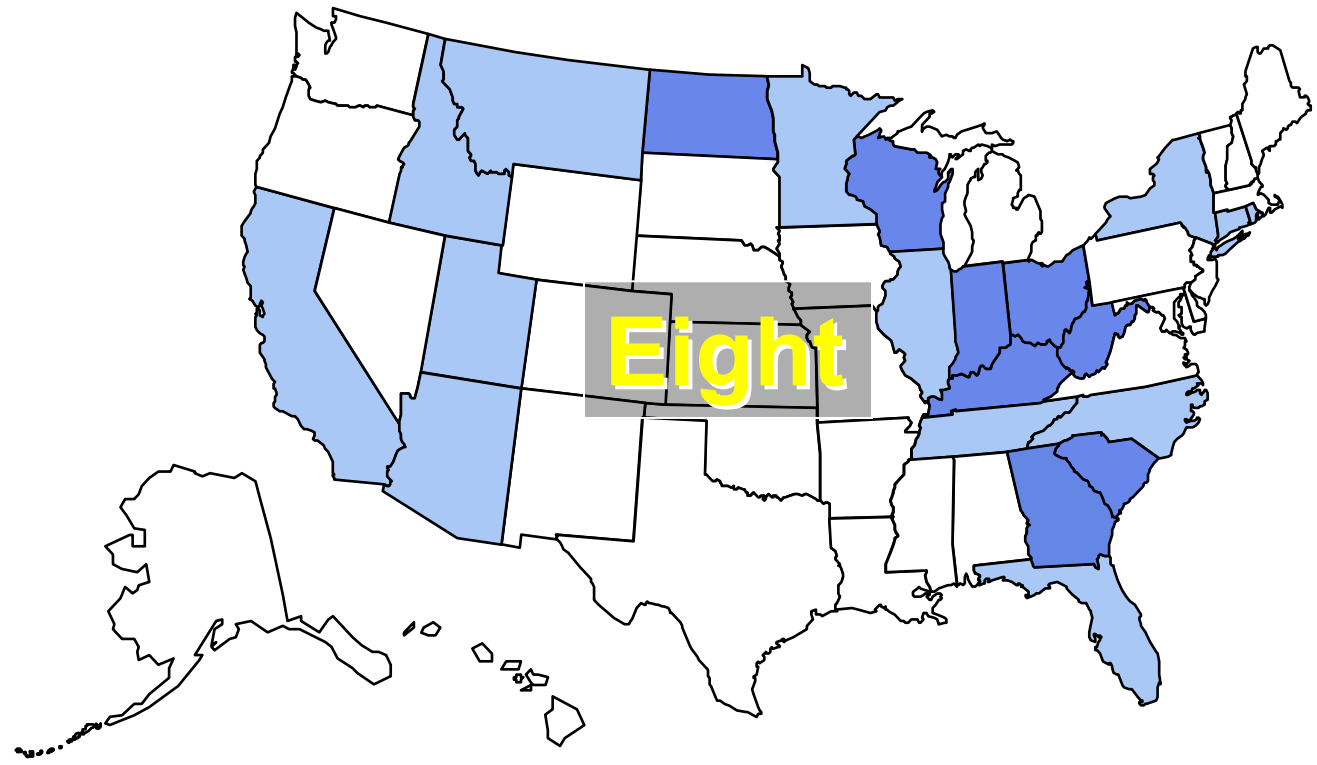


# The Community Guide

- A method to move from research to recommendations:
  - Systematic Review of effectiveness, applicability, potential side effects, economic outcomes, and implementation issues.
  - Takes steps to exclude studies that may limit the validity of the findings.
  - Recommendations for Physical Activity, Nutrition, & Obesity
  - “Beacon of Light to Community Practitioners”

# BRFSS, 1985

(\*BMI  $\geq 30$ , or ~ 30 lbs. overweight for 5' 4" person)

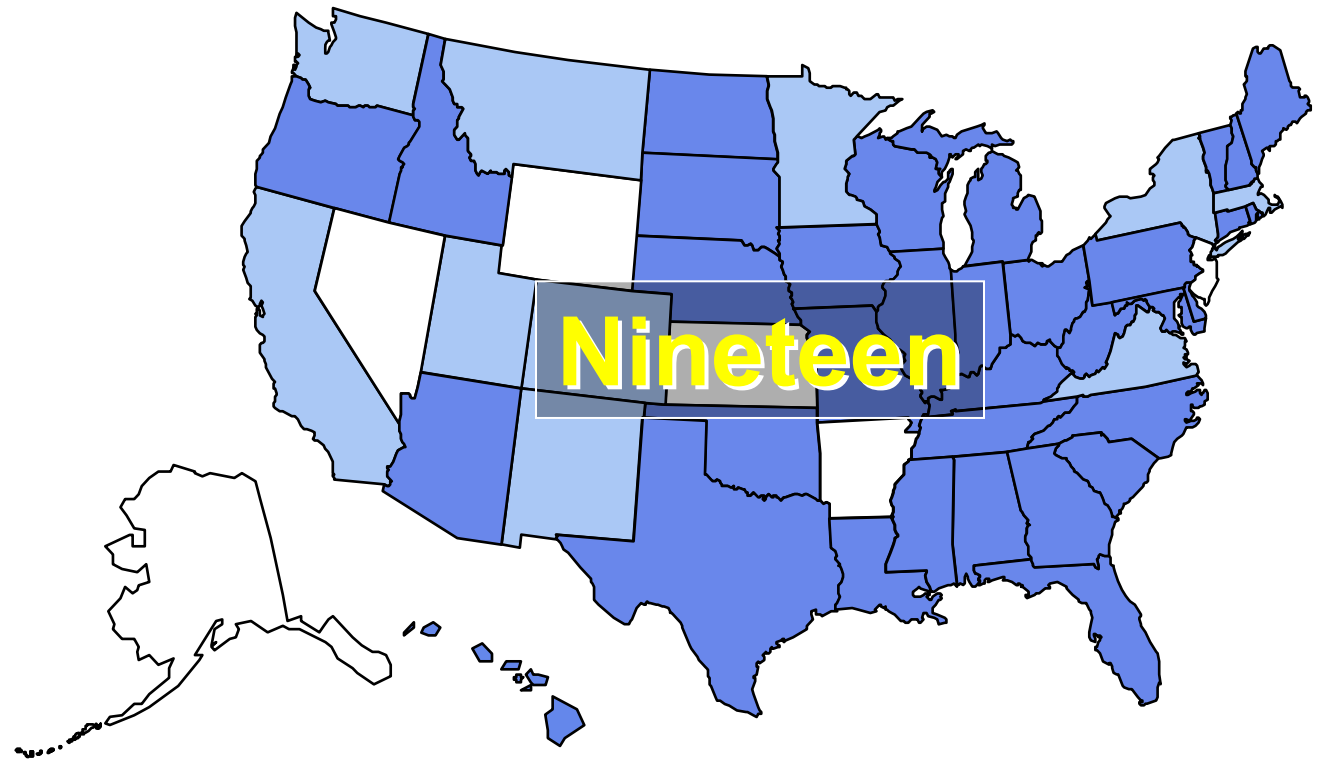


Eight

No Data   <10%   10%-14%

# BRFSS, 1990

(\*BMI  $\geq 30$ , or ~ 30 lbs. overweight for 5' 4" person)



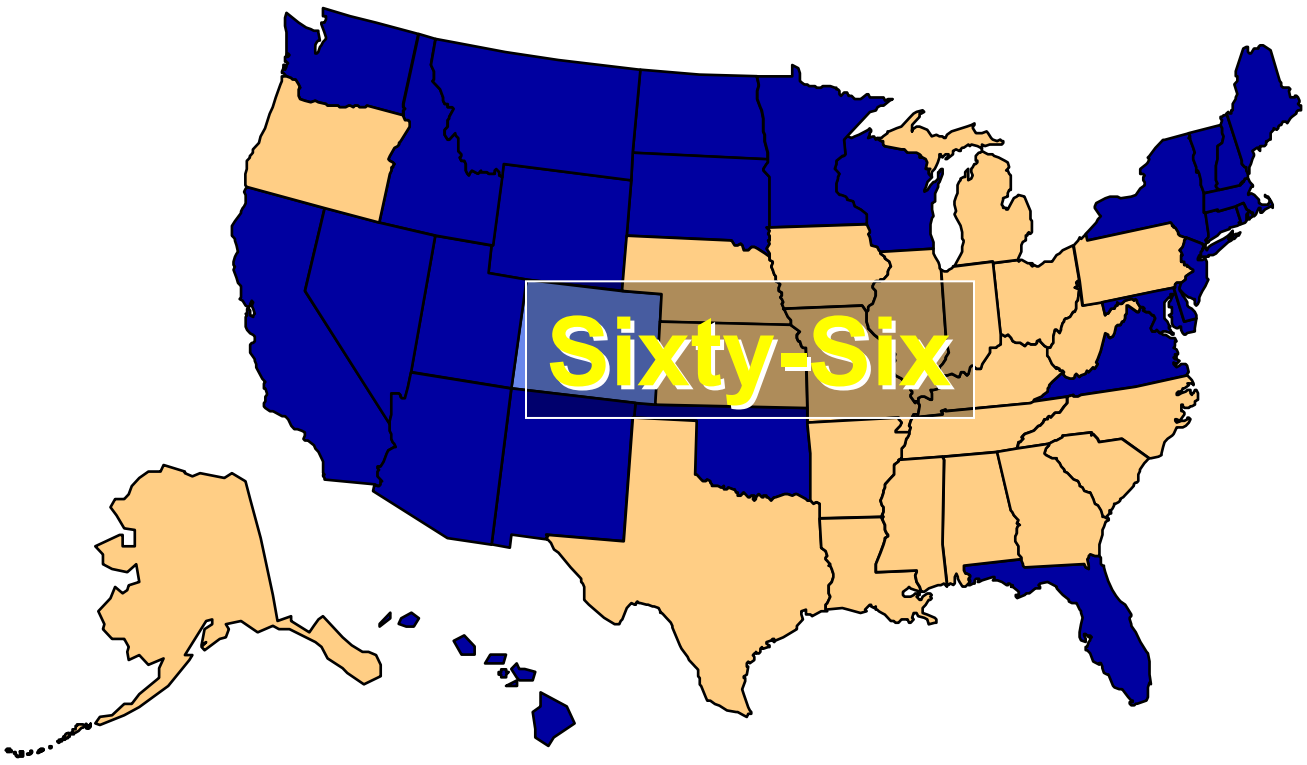
**Nineteen**

No Data   <10%   10%-14%



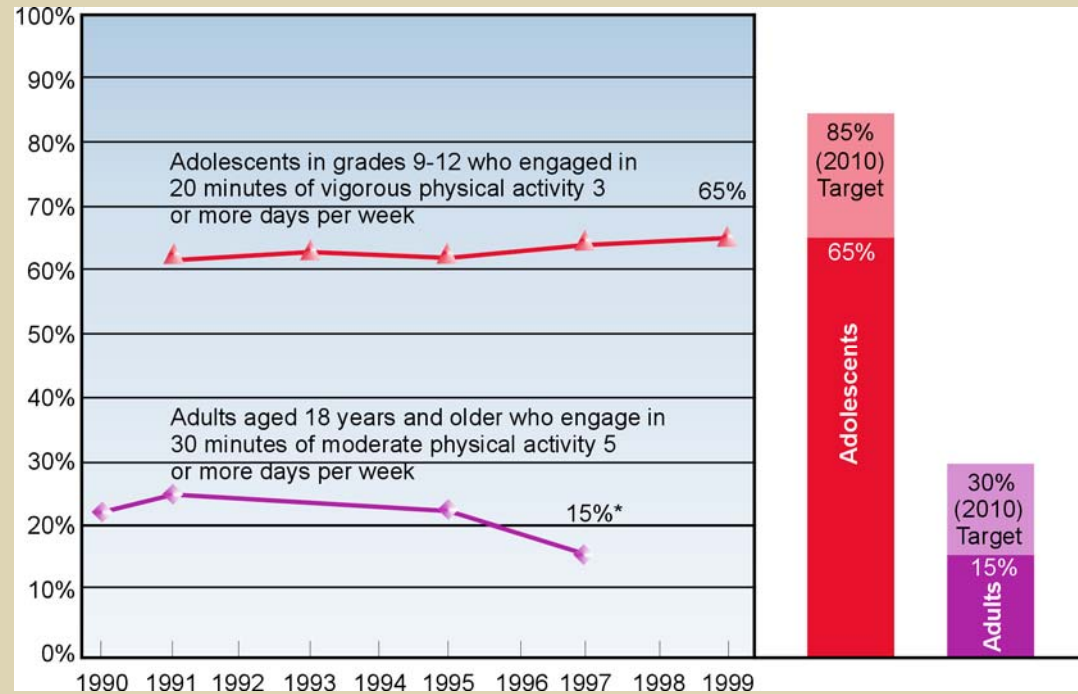
# BRFSS, 2000

(\*BMI  $\geq 30$ , or ~ 30 lbs. overweight for 5' 4" person)



No Data    $<10\%$     $10\%–14\%$     $15\%–19\%$     $\geq 20\%$

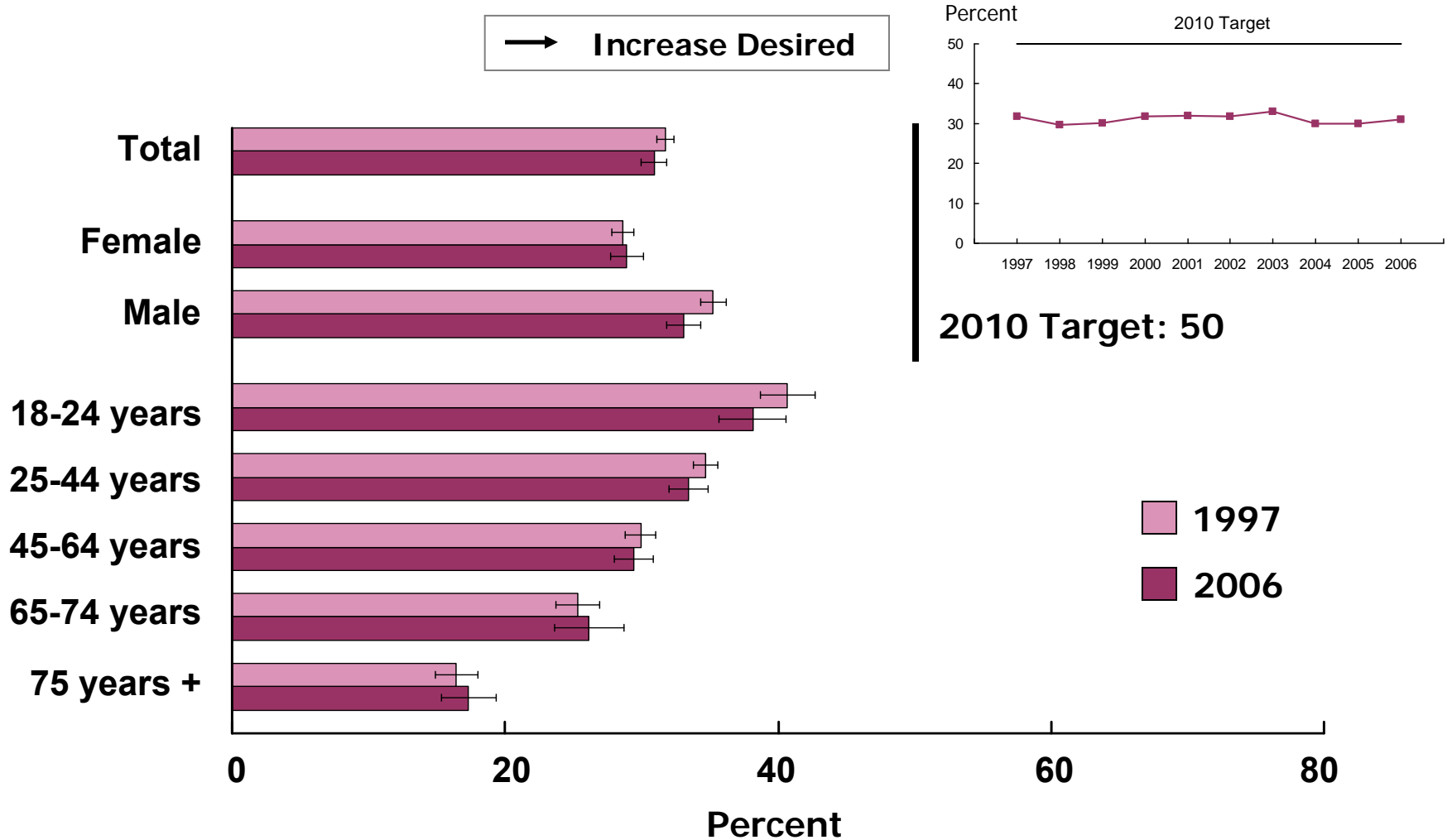
## Participation in regular physical activity, United States, 1990–99



\*The definition of moderate physical activity was changed in 1997.

Sources: Centers for Disease Control and Prevention. Youth Risk Behavior Survey. 1991–97. Centers for Disease Control and Prevention, National Center for Health Statistics. National Health Interview Survey. 1990–99.

# Regular Leisure Time Physical Activity Among Adults



Note: Except for age-specific estimates, data are for adults 18 years and over and are age adjusted to the 2000 standard population. Regular leisure-time physical activity is a moderate or vigorous physical activity (moderate activity 30+ minutes/5+ times per week or vigorous activity 20+ minutes/3+ times per week). I = 95% confidence interval.  
 Source: National Health Interview Survey (NHIS), NCHS, CDC.

# What's Up?

- Community Guide PA Findings
  - Access & Outreach
    - ↑ PA by 48%, Aerobic Capacity by 5%
    - Should be applicable, if adapted**
  - Social support interventions
    - ↑ PA by 44%, Aerobic Capacity by 5%
    - Should be applicable, if adapted**
  - Individually adapted interventions
    - ↑ PA by 35%, Energy expenditure by 64%
    - Should be applicable, if adapted**
    - How about applicability?**



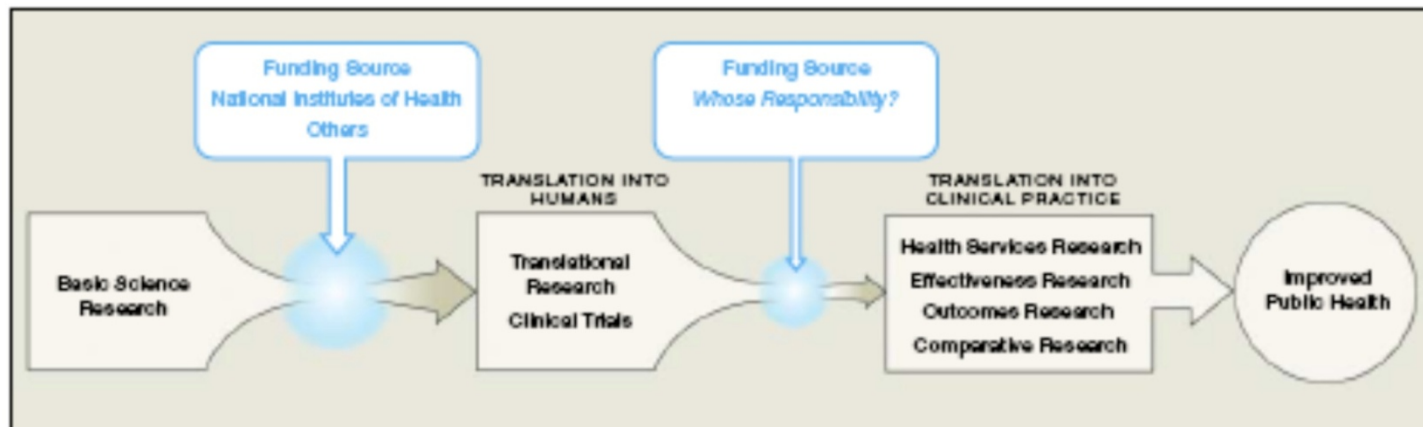
## The Community Guide lets us know what is efficacious, but...

- **we don't know what works to help people be more active, eat more healthfully, and maintain a healthy body weight.**

# Problems with the historic scientific model?

- The assumption of a ‘pipeline’ model of dissemination
- The type of evidence
- Narrowly defined metrics that constitute evidence

# Problems with the pipeline?



Clinical research can be viewed as encountering 2 separate roadblocks on the way toward improving public health. These 2 translational blocks have different factors creating each but whereas the National Institutes of Health has been consistently targeting the bench-to-bedside block, no one is taking responsibility for the second, which is integrally tied with the funding of the health care delivery system.

Crowley WF et al. *JAMA* 2004;291:1120-1126.

# The type of evidence

- CONSORT widely used for reporting trials (only 2 of 23 items address external validity for non-pharmacologic trials)
- Methodological quality ratings used in reviews almost solely internal validity focused
- No such widely used criteria for external validity which are critical for translation and dissemination

# The type of evidence

*External Validity* – “Inferences about the extent to which a causal relationship holds over variations in persons, settings, treatments and outcomes.” (Shadish et al, 2002)

*External Validity* – “To what populations, settings, treatment variables and measurement variables can this effect be generalized?” (Campbell & Stanley, 1963)

Shadish WR, Cook TD, Campbell DT. 2002. Experimental and quasi-experimental design...Boston: Houghton Mifflin  
Campbell DT, Stanley JC. Experimental and quasi-experimental designs for Research. Chicago, IL: Rand McNally. 1966.

# The type of evidence

The importance of external validity in dissemination efforts...

- Local Practitioners:
  - To determine if a program or study is relevant to their particular setting (patients, resources, staff, measures, etc.)
- Decision and Policy Makers:
  - To determine the range of conditions and settings across which a given program/policy/product will apply (generalizability)

Glasgow & Green, Presentation at NIH Dissemination and Implementation Science Meeting, Washington DC, January 2009.

# The type of evidence

*“Lack of consideration of external validity is the most frequent criticism by clinicians of RCTs, systematic reviews, and guidelines.”*

Rothwell PM, *Lancet* 2005(365):82-93

# The type of evidence

***“Where did the field get the idea that evidence of an intervention’s efficacy from carefully controlled trials could be generalized as THE best practice for widely varied populations and settings?”***

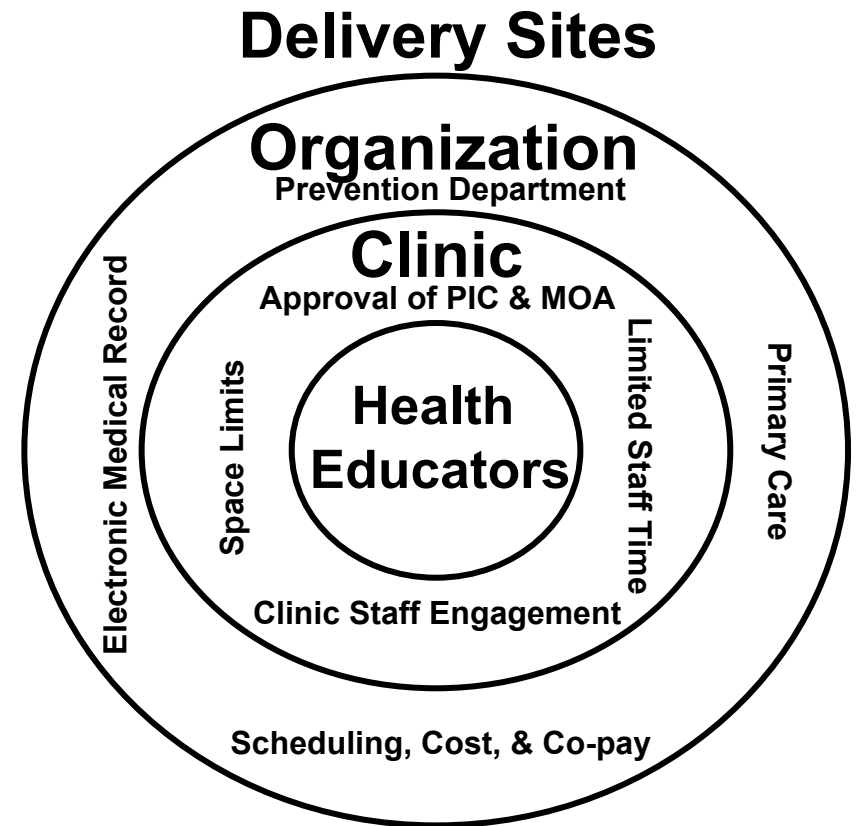
**L.W. Green**

Green LW. From research to "best practices" in other settings and populations  
*Am J Health Behav* 2001; 25:165-78

# Practice-based evidence

## Broader Health Policy and Cultural Context

1. Organizational Mission
2. Economic climate
3. Expertise of delivery agents
4. Resources available



Partnerships across organizational structure define necessary results for decision to deliver broadly across multiple clinics

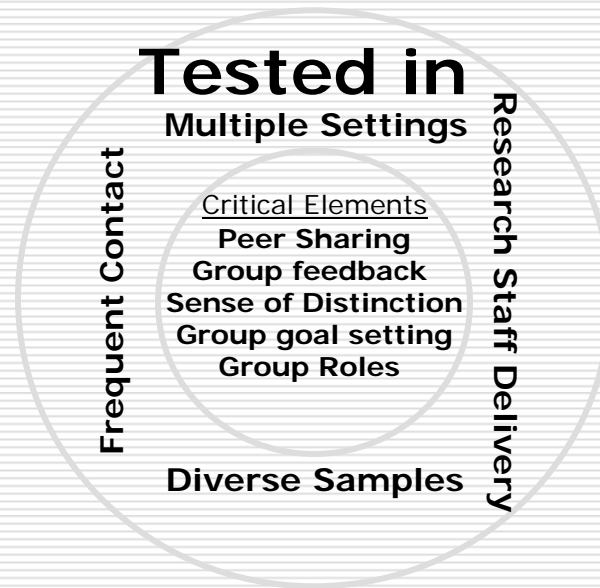
Note: PIC=Physician in Charge; MOA=Medical Office Administrator

# Move More

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1. Goal: To implement an evidence-based team-building physical activity program within an integrated health care organization

## Team-building PA Interventions



# Move More

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## 2. The characteristics of the setting

- a. Centralized control for prevention
- b. Relatively stable
- c. Complex interdependence
- d. Strong leadership support
- e. Focus on innovation



# Move More

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## 3. Traditional Evidence to Practice Translation Approach

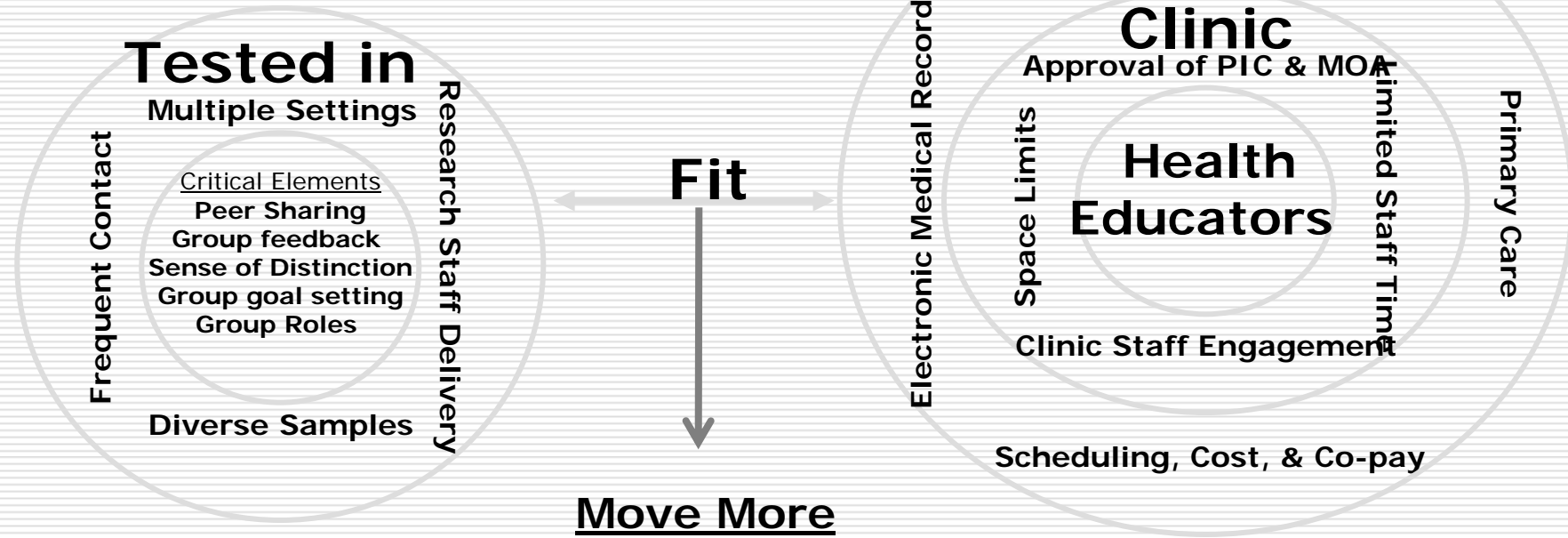
- Select EVP and implement with high level of fidelity

## 4. Misalignments:

- Evidence-base does not include brief, group interventions—insufficient resources
- Removes opportunity for practitioner tacit knowledge use and creativity

# Team-building PA Interventions

# Delivery Sites



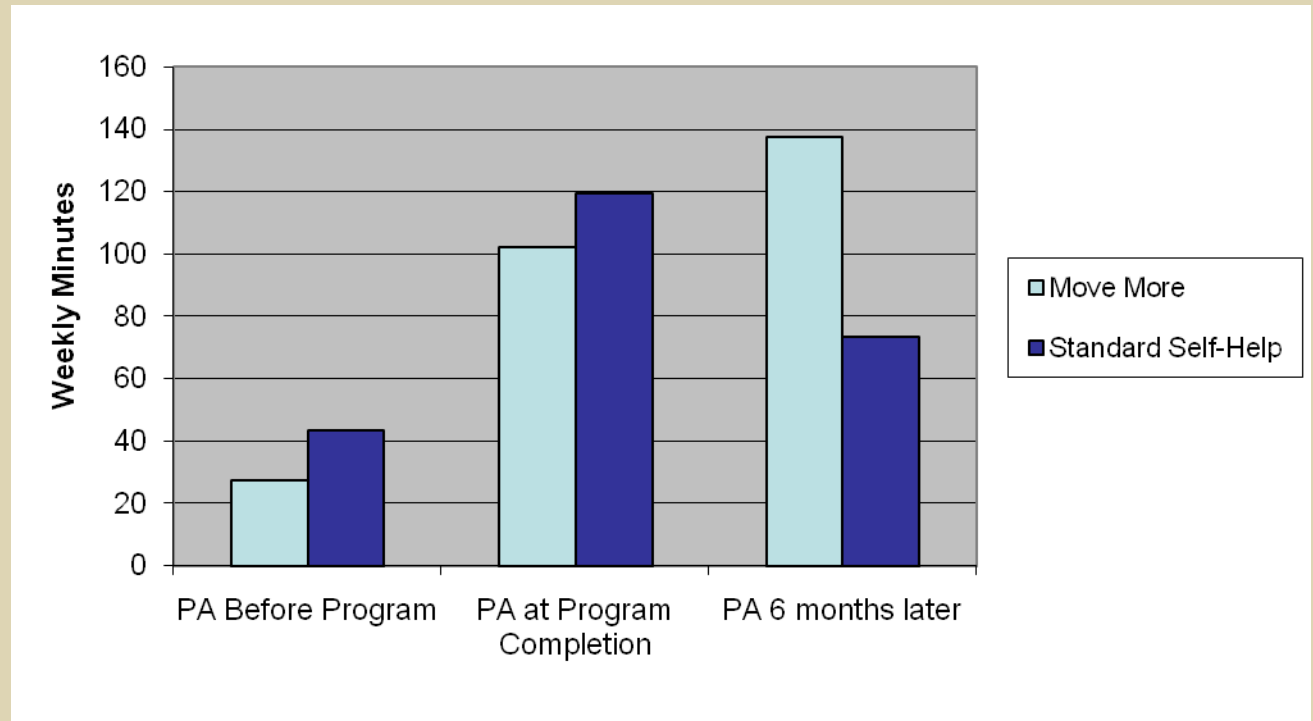
## Move More

Goals → To create a program that would...

1. Use only 2, 2 hour formal group sessions
2. Be aligned with the responsibilities of Kaiser Permanente Health Educators
3. Lead to sustained changes in physical activity **over and above** the KP print resources for physical activity

Estabrooks & Glasgow, 2006; Estabrooks, 2008

# Move More Results



- Continued delivery since 2005

# Proposed translational facilitators

1. Adaptation and re-invention encouraged early
2. Attention to pragmatics—billing, co-payment, non-delivery staff awareness, physician referrals
3. The triadic relationship b/w researchers, implementers, and decision makers
  - Shared development
  - Feedback loop
  - Equal partnership
  - **Identification of criteria that would lead to sustained delivery**

# Translational Metrics: RE-AIM

- To broaden the criteria used to evaluate health promotion programs to include external validity
- To evaluate issues relevant to program adoption, implementation, and maintenance
- To help close the gap between research studies and practice by:
  - **Informing design of interventions**
  - **Providing guides for decision makers**
  - **Providing an evaluative framework to assess potential PHI**

# RE-AIM Dimensions and Definitions

	DIMENSION	DEFINITION
Individual Level	<b>REACH</b>	<ul style="list-style-type: none"><li>➤ Participation rate among eligible individuals</li><li>➤ Representativeness of participants</li></ul>
	<b>EFFICACY / EFFECTIVENESS</b>	<ul style="list-style-type: none"><li>➤ Effects on primary outcome of interest</li><li>➤ Impact on quality of life and negative outcomes</li></ul>

## RE-AIM Dimensions and Definitions (continued)

	DIMENSION	DEFINITION
Setting Level	ADOPTION	<ol style="list-style-type: none"> <li>1. Participation rate among possible settings</li> <li>2. Representativeness of settings participating</li> </ol>
	IMPLEMENTATION	<ol style="list-style-type: none"> <li>1. Extent to which intervention delivered as intended</li> <li>2. Time and costs of intervention</li> </ol>
Both	MAINTENANCE	<ol style="list-style-type: none"> <li>1. (Individual) Long-term effects of intervention ( <math>\geq 6</math> months )</li> <li>2. (Individual) Impact of attrition on outcomes</li> <li>3. (Setting) Extent of continuation or modification of treatment</li> </ol>

# RE-AIM

- To date, RE-AIM has predominately been applied to a single dimension at a time.
- Combining two or more RE-AIM dimensions may be useful for making policy comparisons and decisions.
  - Individual Level Impact
    - RE: Reach X Effectiveness
    - RE2: Problem Prevalence X RE (Attributable Individual Level Impact)
    - RE3: Incremental cost of treatment-control/Incremental RE of Treatment-control (Efficiency)
  - Setting Level Impact
    - AI: Setting Adoption X Staff Adoption X Implementation
    - AI2: AI X number of target settings X Average number served per setting
  - RE-AIM Average

# An exercise to consider broader metrics

- Examine individual level calculations for a commercial internet and incentives-based worksite weight loss program.
- Compare these calculations to fictitious, but realistic data from a worksite weight loss small group intervention and individual counseling

	Internet	Small Group	Individual
<b>Total Employees</b>	<b>10523 (68% Women)</b>	<b>10523 (68% Women)</b>	<b>10523 (68% Women)</b>
<b>% Eligible</b>	<b>64%</b>	<b>64%</b>	<b>64%</b>
<b># Informed</b>	<b>10523</b>	<b>10523</b>	<b>10523</b>

# Reach

	Internet	Small Group	Individual
<b>Total Employees</b>	<b>10523</b> <b>(68% Women)</b>	<b>10523</b> <b>(68% Women)</b>	<b>10523</b> <b>(68% Women)</b>
<b>% Eligible</b>	<b>64%</b>	<b>64%</b>	<b>64%</b>
<b># Informed</b>	<b>10523</b>	<b>10523</b>	<b>10523</b>
<b># Participate</b> <b>(men/women)</b>	<b>1450</b> <b>2748</b>	<b>350</b> <b>450</b>	<b>100</b> <b>150</b>

- Which program should a worksite choose?

# Effectiveness

	Internet	Small Group	Individual
<b>Total Employees</b>	<b>10523 (68% Women)</b>	<b>10523 (68% Women)</b>	<b>10523 (68% Women)</b>
<b>% Eligible</b>	<b>64%</b>	<b>64%</b>	<b>64%</b>
<b># Informed</b>	<b>10523</b>	<b>10523</b>	<b>10523</b>
<b>Mean weight <math>\Delta</math> intervention</b>	<b>-2.5 pounds</b>	<b>-12 pounds</b>	<b>-24 pounds</b>
<b>Mean weight <math>\Delta</math> control</b>	<b>+1 pound</b>	<b>+1 pound</b>	<b>+1 pound</b>

- Which program should a worksite choose?

# Cost per participant

	Internet	Small Group	Individual
<b>Total Employees</b>	<b>10523</b> <b>(68% Women)</b>	<b>10523</b> <b>(68% Women)</b>	<b>10523</b> <b>(68% Women)</b>
<b>% Eligible</b>	<b>64%</b>	<b>64%</b>	<b>64%</b>
<b># Informed</b>	<b>10523</b>	<b>10523</b>	<b>10523</b>
<b>Cost PP</b>	<b>\$54</b>	<b>\$240</b>	<b>\$480</b>

- Which program should a worksite choose?

# Effectiveness

	Internet	Small Group	Individual
<b>Total Employees</b>	<b>10523 (68% Women)</b>	<b>10523 (68% Women)</b>	<b>10523 (68% Women)</b>
<b>% Eligible</b>	<b>64%</b>	<b>64%</b>	<b>64%</b>
<b># Informed</b>	<b>10523</b>	<b>10523</b>	<b>10523</b>
<b># Participate (men/women)</b>	<b>1450 2748</b>	<b>350 450</b>	<b>100 150</b>
<b>Mean age participants</b>	<b>42.9</b>	<b>42.9</b>	<b>42.9</b>
<b>Mean age Total</b>	<b>42.4</b>	<b>42.4</b>	<b>42.4</b>
<b>Mean weight <math>\Delta</math> intervention</b>	<b>-2.5 pounds</b>	<b>-12 pounds</b>	<b>-24 pounds</b>
<b>Mean weight <math>\Delta</math> control</b>	<b>+1 pound</b>	<b>+1 pound</b>	<b>+1 pound</b>
<b>Cost PP</b>	<b>\$54</b>	<b>\$240</b>	<b>\$480</b>

# Clarifying Reach

## Calculations

- Participation Rate & Representativeness

- Participation Rate

$$= \frac{\text{No. of people willing to participate}}{\text{No. of people eligible}} * 100$$

- Representativeness:

= the median ES across the representativeness comparisons across characteristics of participants versus those declining participation

## Reach Summary

- Participation Rate – Median ES for representativeness

# Clarifying Effectiveness

- Calculations
  - Composite Intervention Effective

$$(E) = (MES_{\text{primary outcome}} - MES_{\text{negative outcome}} - MES_{\text{differential impact}})$$

Assesses not only standardized effect size, but takes into account potential negative and differential effects.

# Reach by Effectiveness

Definition: RE is a composite measure for assessing the reach and effectiveness of an intervention at the individual level.

$$\text{RE1} = \text{Reach} * \text{Effectiveness}$$

$$= 0.89 * .37$$

$$= 0.33$$

# Reach by Effectiveness by Cost

Definition: RE efficiency measures the efficiency and reach in terms of money.

Per participant cost of treatment = \$54

Incremental impact of RE 1 = 0.33

$$\begin{aligned} \text{RE 3} &= \frac{\text{Cost of treatment}}{\text{Incremental RE1 of treatment}} \\ &= 54 / 0.33 \\ &= 163.64 \end{aligned}$$

# Comparisons

	Internet	Small Group	Individual
<b>Participation Rate</b>	<b>62.4%</b>	<b>7.6%</b>	<b>2.4%</b>
<b>Representative</b>	<b>-.27</b>	<b>-.27</b>	<b>-.27</b>
<b>REACH</b>	<b>.89</b>	<b>.35</b>	<b>.26</b>
<b>Effect Size</b>	<b>.45</b>	<b>1.7</b>	<b>3.2</b>
<b>Diff. Effects</b>	<b>.08</b>	<b>.08</b>	<b>.08</b>
<b>EFFECTIVENESS</b>	<b>.37</b>	<b>.9</b>	<b>2.6</b>
<b>RE1</b>	<b>.33</b>	<b>.32</b>	<b>.68</b>
<b>RE (efficiency)</b>	<b>\$163.64</b>	<b>\$750</b>	<b>\$705.88</b>

- Which program should a worksite choose?

# Comments

- All aspects of individual assessment will influence individual level composite scores
- The need for comparative data to determine normative values is clear
- Some issues with combining effect sizes and prevalence scores (the issue of negativity)
  - Closer adherence to the rules of probability may allow for a more interpretable range of scores (i.e., 0 to 1).

# Compelling for policy?

- Do we need more ‘grounded’ information.
- Reach by effectiveness example using the same internet program data:
  - Approximately 10% of the employee population will benefit
  - Those who benefit will lose 9.5 pounds on average.
  - Women will be more likely to be successful
  - The cost is \$171 per successful employee
  - These data come from worksites where employees use computers for job related tasks.

# Next steps?

- Data is nearly impossible to come by across the individual level factors
- The organization level metrics are equally (or more lacking in information in the extant literature.
  - Consistency in reported is needed (Editors workgroup)
  - Methods to present this data in a relatively brief way
- Integrate conceptual metrics with descriptive language that will be compelling for policy makers

# Summary

- Traditional efficacy trials have not lead to broad dissemination or changes in population level physical activity
- Partnerships that balance research *and* practice-based evidence provide a foundation for behavioral intervention development and testing
- Movement beyond a singular focus on efficacy as *the most important outcome*

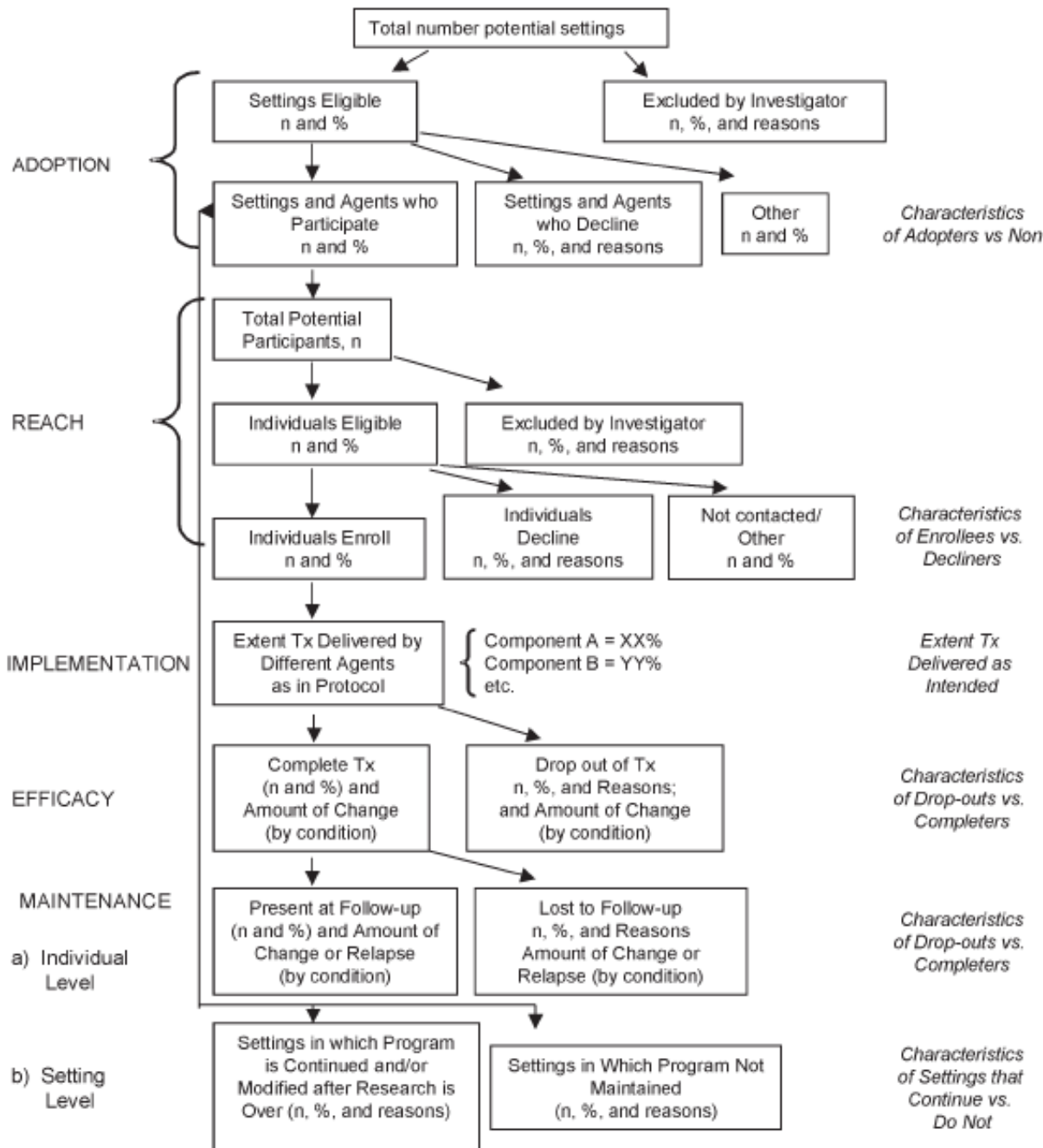


*"My question is: Are we making an impact?"*

RE-AIM Issue

Content

Critical Considerations



# Proposed Reporting Standard to Enhance EV Criteria Inclusion

Estabrooks, Dzewaltowski, Glasgow Klesges, 2002.