

# MOTIVATING HEALTH BEHAVIOR CHANGE

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# Outline

- Why is it so difficult to change behavior?
- The importance of theory
- Motivational Interviewing as a vehicle to delivery theory based interventions
- Applications

# My Research: Develop and Test Health Behavior Interventions

## **Health Behaviors**

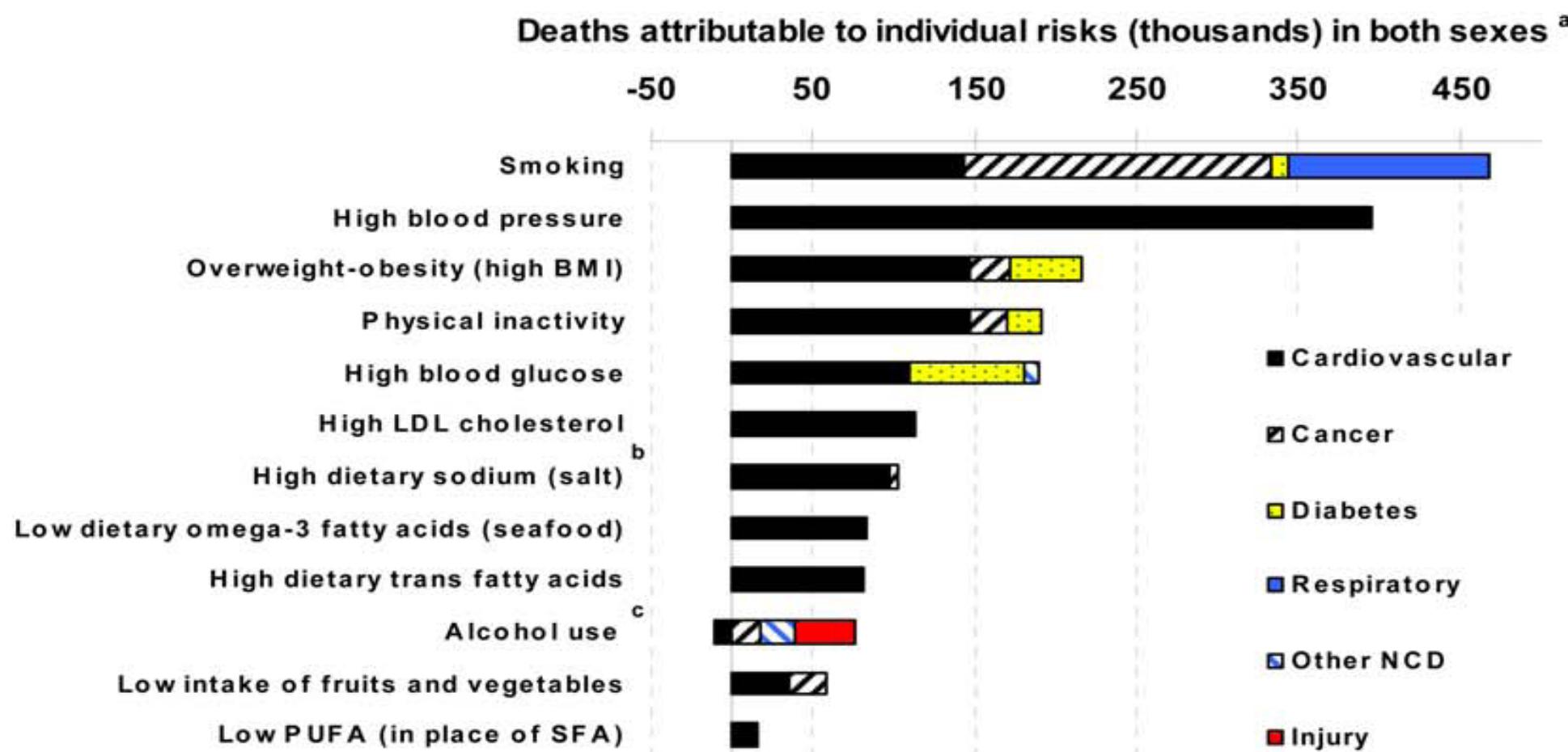
- Smoking Cessation & Second Hand Smoke Reduction
- Medication Adherence (Cystic Fibrosis, Asthma)
- Sleep Apnea
- Pediatric Oral Health

## **Underserved Populations:**

- Medically ill
- Physical Disabilities
- Low income & Inner city
- Hispanic, African-American, Native American

## **Across the Lifespan:**

- Children, Teens, Adults, Older adults



Danaei G, Ding EL, Mozaffarian D, Taylor B, Rehm J, et al. (2009) The Preventable Causes of Death in the United States: Comparative Risk Assessment of Dietary, Lifestyle, and Metabolic Risk Factors. PLoS Med 6(4): e1000058.

# Internal forces against change

*“My child is big-boned. She’s not overweight.”*

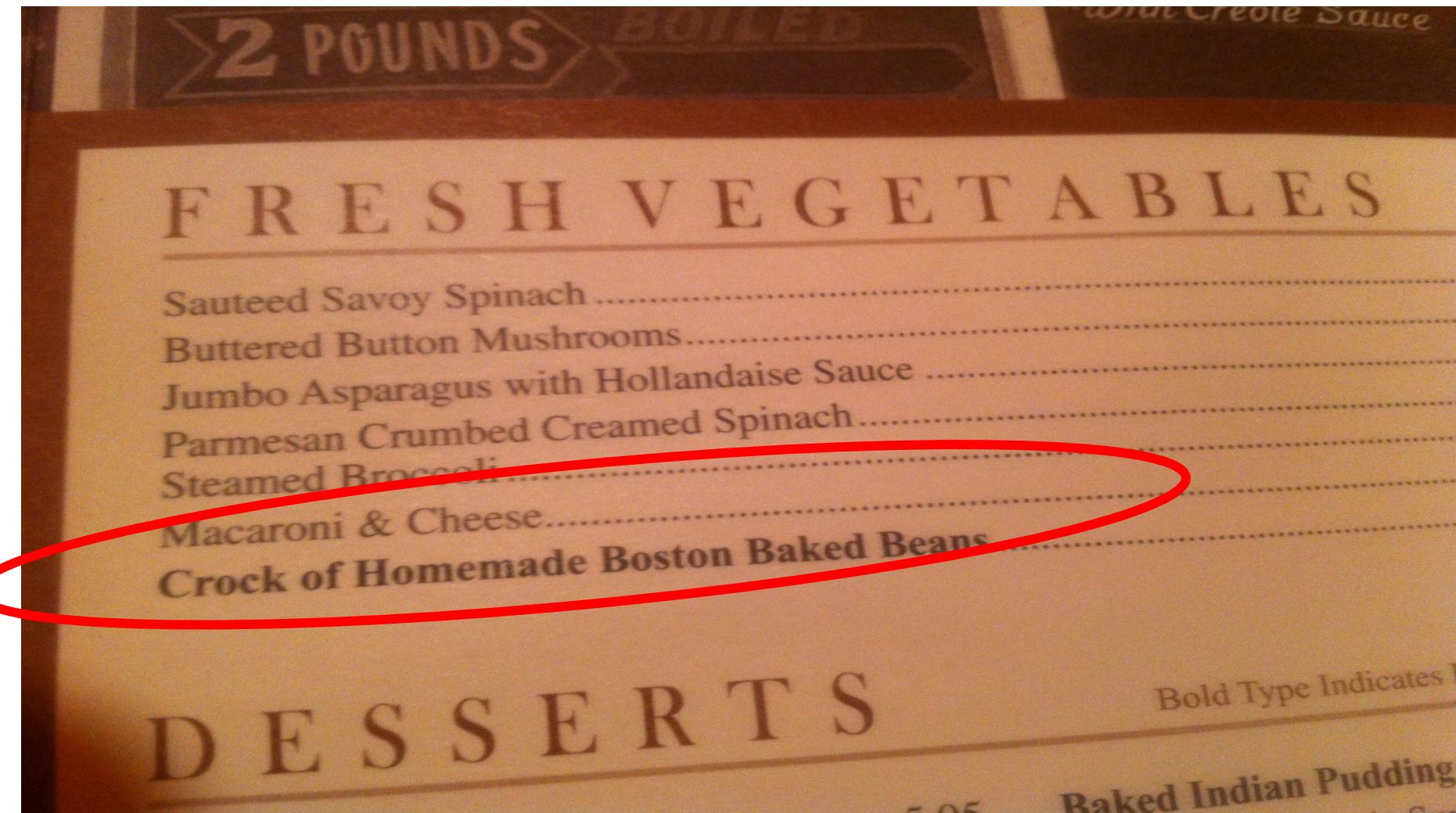
*“I would rather eat what I want and smoke and die early than to have to go through all of these changes.”*

*“I want to take my medicine but I keep forgetting.”*

*“I’ve tried so many times to diet and failed. What’s the point?”*

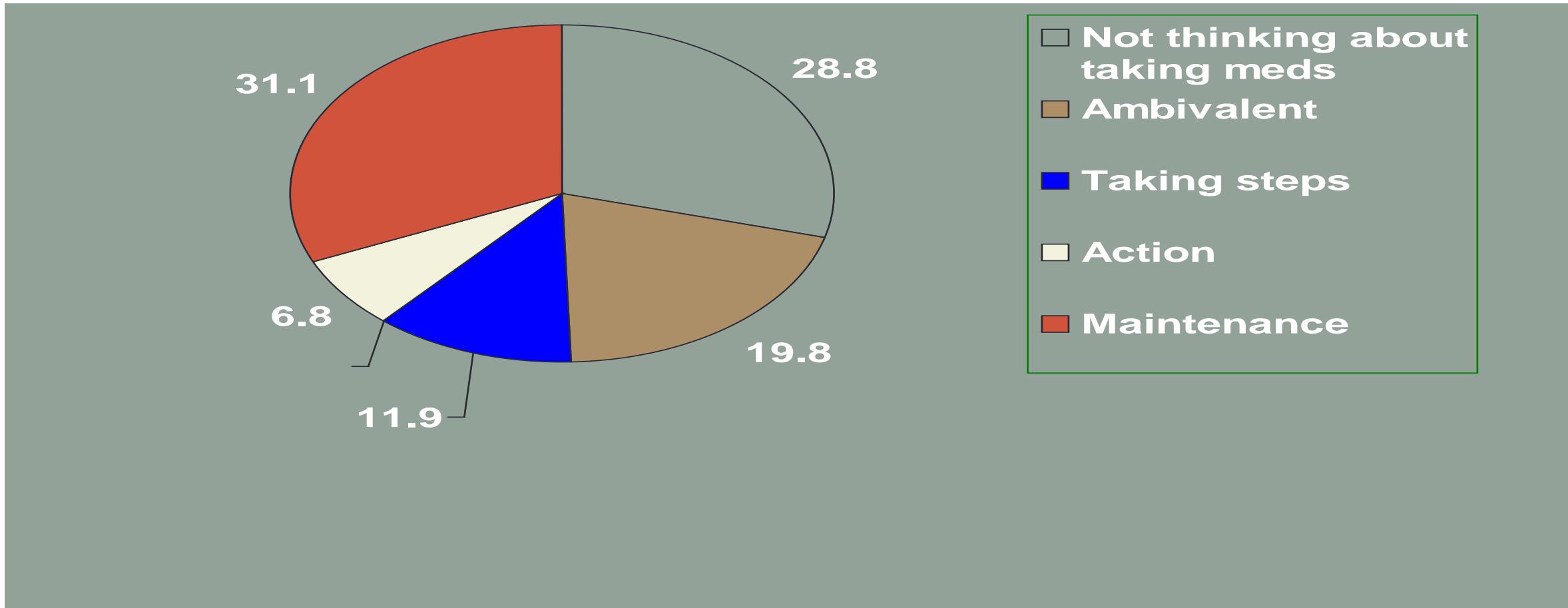
*“I drink a bit, but not more than my friends and I have a good job.”*

# External Forces



# Stage of Change and HTN Meds

Wiley et al



## Targets for Adherence

- Treatment entry
- Treatment adherence
- Treatment engagement
- Treatment response
- Maintenance of treatment adherence/response

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# Importance of Theory

- ◆ Theory guides the search for why people do/do not change behavior.
- ◆ Set of concepts that explain or predict events by illustrating relationships between variables.
  - ◆ Helps identify targets for intervention.
  - ◆ Provides coherence to health behavior interventions.
  - ◆ Guides development of program strategies to reach target audiences and have maximum impact.
  - ◆ Must be applicable to a broad variety of situations.
- IOM, WHO, Surgeon General
  - Recent reports emphasizing examination of social and behavioral determinants of health and disease.

# Theory and Treatment Effects

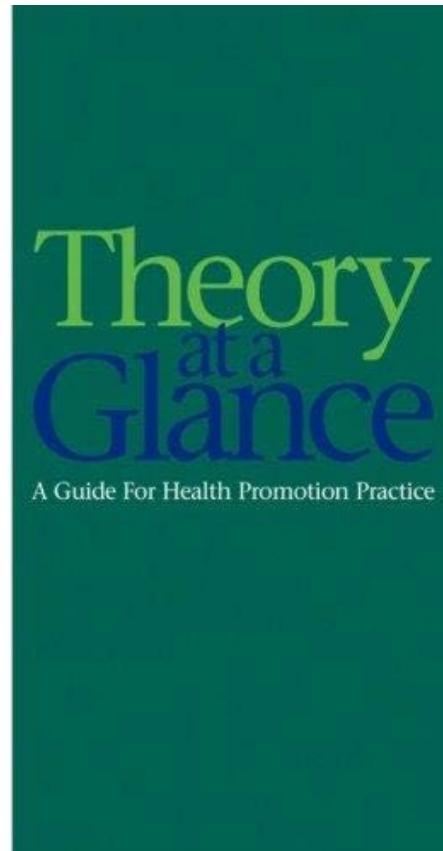
- Preserves the internal validity
  - More efficient and effective delivery
  - Helps ensure that the intervention is delivered as intended
  - Increases a providers' ability to work flexibly with different patients.
- ◆ Interventions based on theory have greater treatment effects (Ellis et al 2007).
- ◆ Enhances replicability and exportability.

# Challenges for Using Theory

- Initiation and maintenance of behaviors.
- Complex constellation of behaviors
- Individual, social, and economic determinants of behavior.
- Theory must map onto intervention components that can be delivered in the real world: clinical and community settings.
- Array of psychological theories, many with overlapping constructs.

# Types of Theories

- Explanatory Theories (Why)
  - Health Belief Model
  - Theory of Planned Behavior
  - Social Cognitive Theory
  - Behavioral Activation theory
- Change Theories (Process)
  - Stage of Change
  - Precaution Adoption Process Model
- Ecological Theories (Multiple levels of influence)
  - Diffusion of Innovations Theory
  - Community Organization and Other Participatory Models
- Conceptual Frameworks (models for merging theory+practice)
  - Chronic Care Model
  - Precede-Proceed



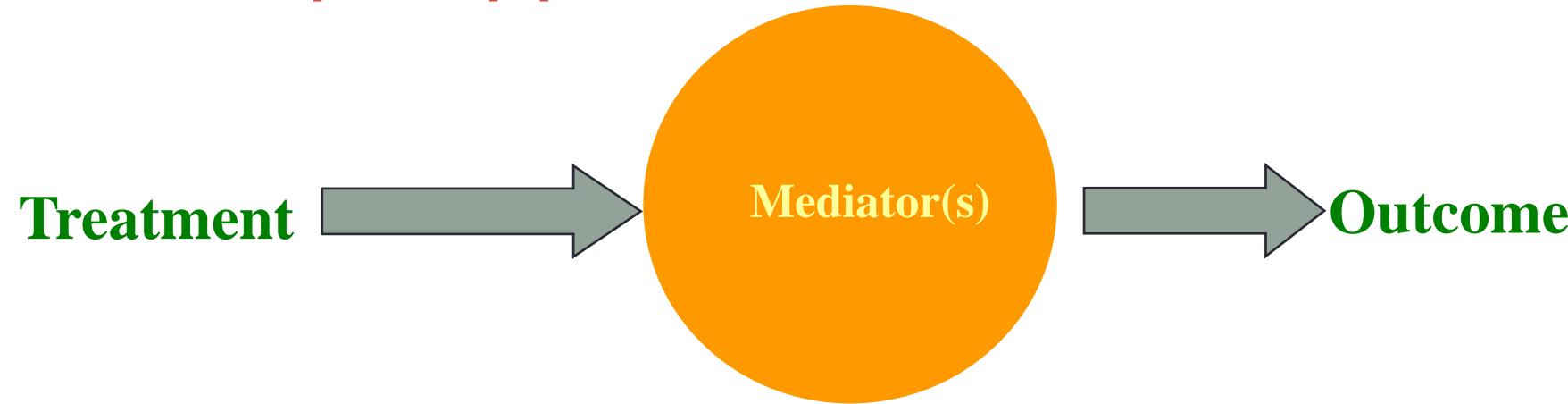
# Process of Theory Testing

1. Identify theoretical model(s): review of literature, expert consultation, how well a particular theory fits a particular issue.
  - Ensure that it takes into account multiple factors that influence behaviors.
2. Outline theory, components, and constructs and map onto operationalization of the intervention.
  - Closely specify which aspects of the intervention relate to specific dimensions of the models.
  - Use Protocol Review Group (independent experts)
3. Pilot test intervention, use feedback from participants and providers to refine intervention to more closely fit theoretical model.
4. Assess change in outcome and change in theoretical constructs as a function of the intervention, using mediational analyses.

# Monitor Theory During Implementation

- Interventions that articulate a theory without monitoring fidelity to the theoretical components lead to weak effects (Zakarian et al 2008).
- Assess adherence to theory during delivery of intervention.
  - Theoretical fidelity
  - Independent raters rate theoretical components/guess theory
- Ensure that control group is not getting theoretical components.
- Avoid dilution of theories (measuring some constructs, not others).
- Avoid mixing theories (CBT+ feedback is not CBT; its applied behavioral analysis).

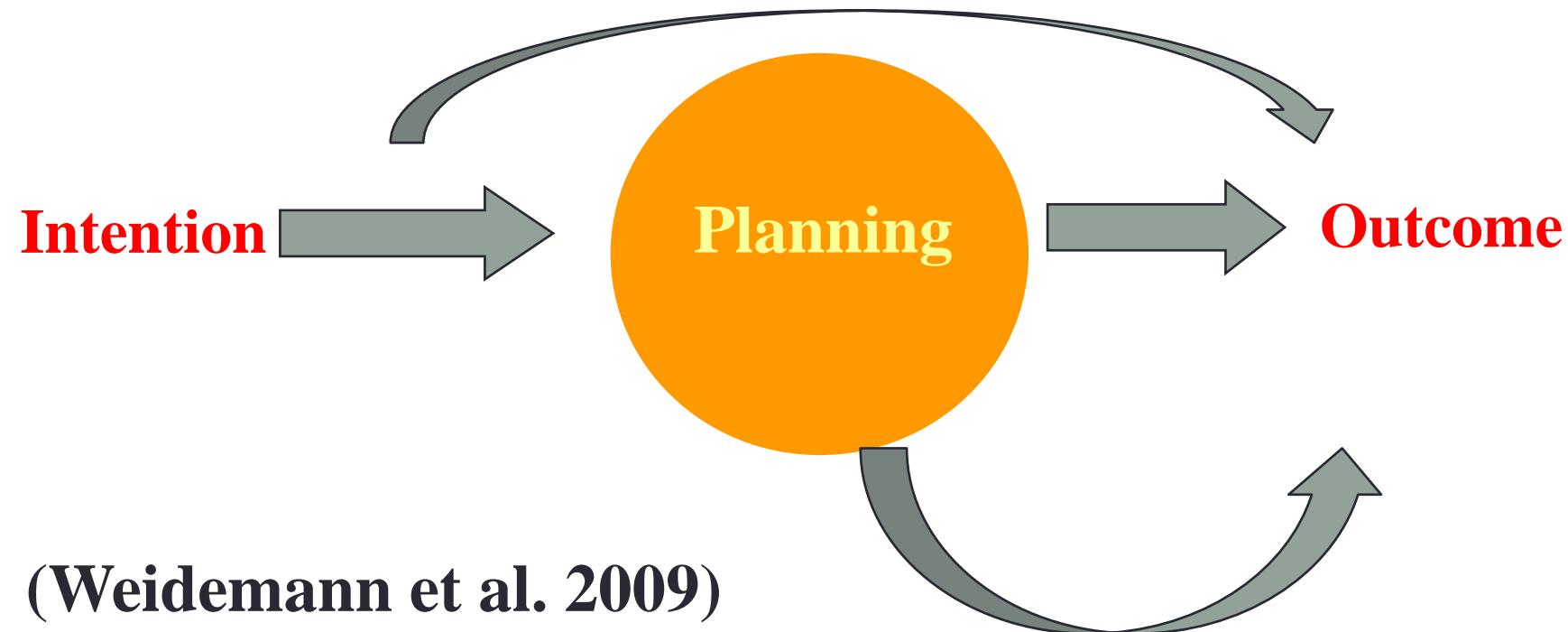
# Potential Mediators of Tx Effect: Causal Steps Approach



**Significant association between:**

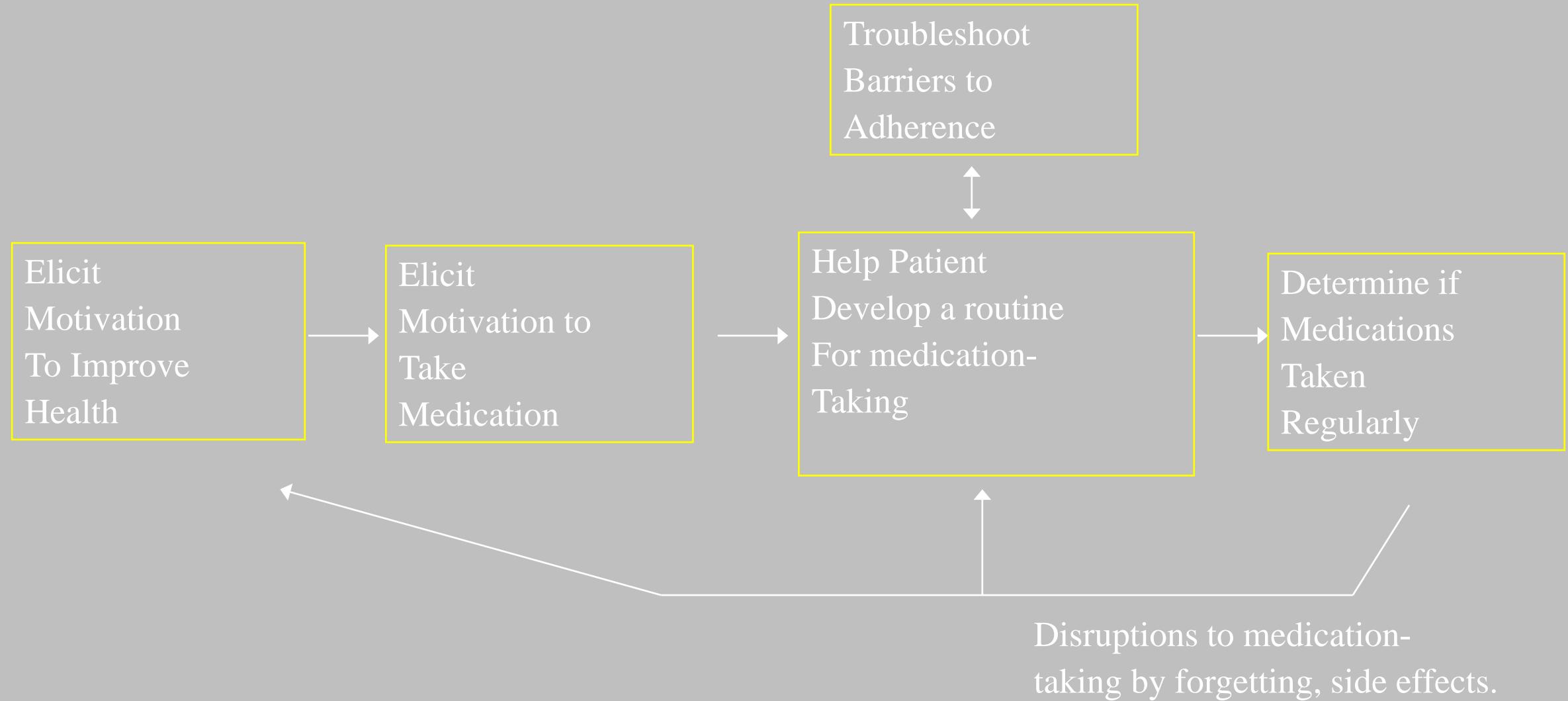
1. Tx and outcome
  2. Tx and mediator
  3. Mediator and Outcome
  4. Reduced association between tx and outcome when mediator in the model
- (Mackinnon et al 2002; Baron & Kenny, 1986)

# Moderated-Mediation Models

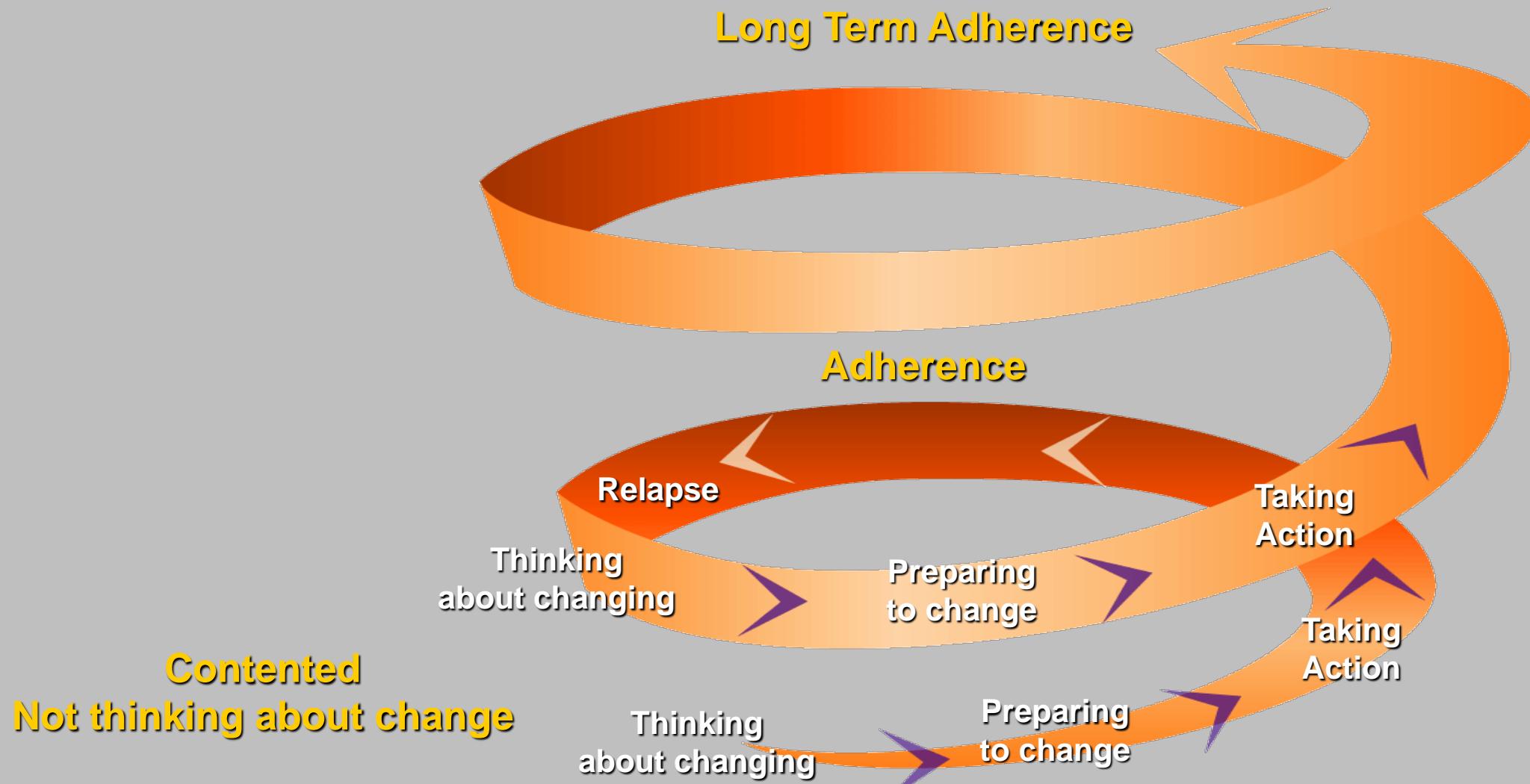


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Adopted from Rosen, Ryan, & Rigsby (2002). Behavior change, 19(4), 183-190



1. Prochaska JO, et al.. *Am Psychol* 1992; **47**:1102–1114.

# Problems with Standard Practice

- Unwelcome advice elicits resistance
- Knowledge weakly correlated with behavior change
- Controlling and directive approaches are appropriate for acute care, not behavior change.
- Mismatch between counseling approach and patient's level of motivation

# Motivational Interviewing (MI)

- Patient Centered
  - Explore patient's reasons for and against change.
  - Technique to raise change issues without patient resistance.
  - Collaborative, not prescriptive.
- Designed to enhance intrinsic motivation
  - Conduct consultation in manner that the patient feels responsible for the decision to change (enhances sustainability of change).

Miller & Rollnick, 1991, 2002  
Borrelli, Riekert, Weinstein & Cardella, 2007  
Borrelli, Tooley, Scott-Sheldon, 2015

# Communication Styles

## Fix-it Role

- Focused on problem & solution
- Parental relationship
- I am the expert
- Assumes pt. motivated
- Advise, warn, persuade
- Goals are prescribed
- Argumentation and correction of pt's perspective

## Motivational

- Focused on pt's concerns and perspectives
- Equal partnership
- Match intervention to pt level of motivation
- Emphasize personal choice
- Ambivalence: normal part of the change process.
- Resistance: influenced by counselor behavior.

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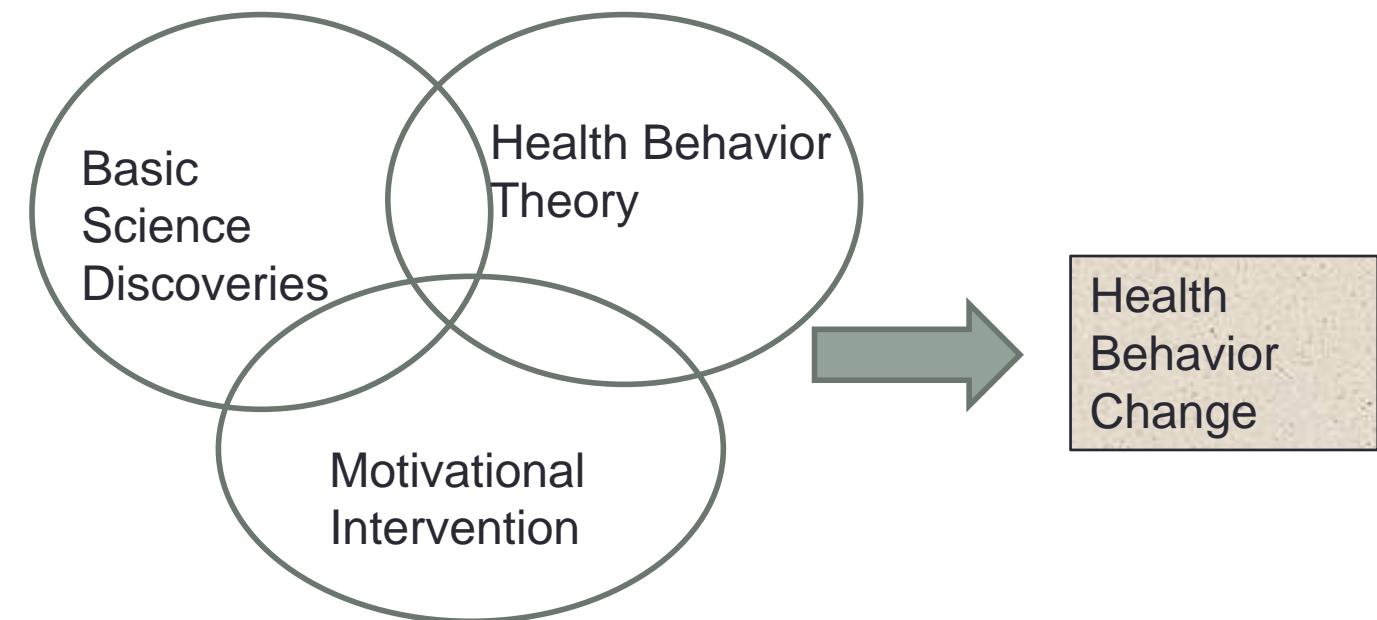
# Home Health Care Nurses as a New Channel For Motivating Smokers to Quit

- Randomized and trained home care nurses (N=98) to deliver one of two smoking cessation interventions to their patients who smoke:
  - Motivational Interviewing + Biomarker Feedback
  - Standard Care (SC)



# Biomarker Feedback

- Biological indices of physical harm, disease, or increased disease risk
- Use MI as a vehicle to deliver biomarker feedback to increase motivation to change health behavior.



# Carbon Monoxide Feedback



BedFont Smokelyzer

- CO binds to haemoglobin to form COHb
- This prevents red blood cells from carrying oxygen
- Smokers may have 10% of their blood cells taken up by CO, depriving the body of O<sub>2</sub>.
- Intervention: Provide CO level, discussion of symptoms, and how the body repairs itself after quitting.

↓  
Risk Perception Theory



20 minutes after:

- Blood pressure and heart rate drop to normal
- Body temperature of hands and feet increases to normal



10 years after quitting:

- Lung cancer death rate for average smoker drops to 12 per 100,000 - almost the same as the rate for non-smokers
- Pre cancerous cells are replaced
- Other cancers – such as those of the mouth, larynx, esophagus, bladder, kidneys, and pancreas – decrease.
- There are 30 chemicals in tobacco smoke that cause cancer.

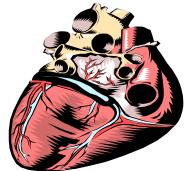
## What happens when you Stop Smoking \*

8 hours after:

- Carbon monoxide level in the blood drops to normal
- Oxygen level in the blood increases to normal

24 hours after:

- Chance of heart attack decreases.

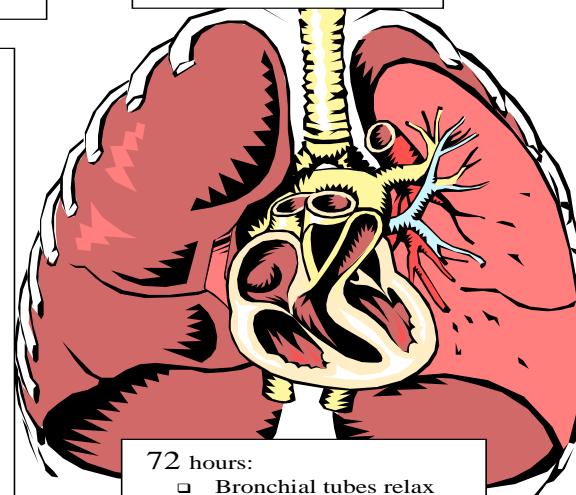


48 hours after:

- Nerve endings start to regrow
- Ability to smell and taste improves.

2 weeks – 3 months:

- Circulation improves.
- Walking becomes easier.
- Lung function improves by up to 30%



72 hours:

- Bronchial tubes relax making breathing easier.
- Lung capacity increases

5 years:

- Lung cancer death rate for average smoker (1 pack a day) decreases from 137 per 100,000 to 72 per 100,000

1 - 9 months:

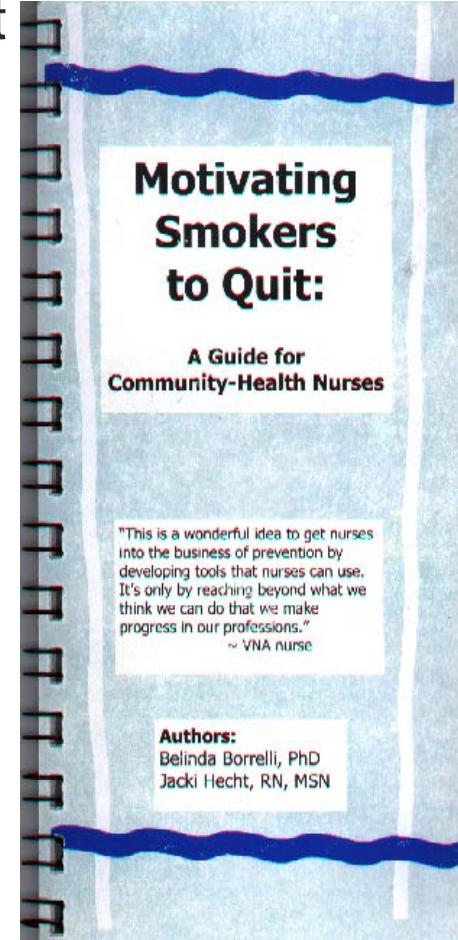
- Coughing, sinus congestion, shortness of breath decrease.
- Cilia regrow in lungs, increasing ability to handle mucus, clean the lungs, and reduce infection.

# Intervention Mapping for Social Cognitive Theory

Concept	Definition	Intervention
<b>Goal setting</b>	Personal regulation of goal-directed behavior or performance	Self-monitoring, goal setting, problem solving, and subgoals.
<b>Reinforcements</b>	Responses to a person's behavior that increase or decrease the likelihood of reoccurrence	Self-initiated rewards and incentives for achieving both large and small goals.
<b>Motivation</b>	Importance and desire to change	MI; pros/cons of change
<b>Self-efficacy</b>	The person's confidence in performing a particular behavior	Small steps; seek specificity about the change; modeling, encouragement
<b>Outcome Expectations</b>	Belief that performance of behavior leads to desired outcome.	Reframe past failures as learning experiences; focus on small + change.
<b>Behavioral Coping</b>	Strategies used to deal with emotional stimuli	Problem solving and stress management; practice skills in emotionally arousing situations. Relapse prevention.

# Designing for Dissemination: Community based Participatory Research

1. Informal meetings with VNA nurses and management
  - Needs Assessment
  - JAHCO beginning to emphasize smoking counseling
  - PI goes on home care visits
2. Focus groups
  - Barriers to intervention delivery (nurse, system)
  - Attitudes and beliefs about smoking
  - Reactions to the program
  - Development of prototypes of intervention guides
3. Pilot Intervention
4. Focus groups
  - Field experiences
  - Reactions to using the pocket guide



\*Funded by The Robert Wood Johnson Foundation

# % Quit Smoking, Bioverified

## Continuous Abstinence

<u>TIME</u>	<u>SC</u>	<u>MI</u>	<u>O.R</u>	<u>95% C.I.</u>
<b>End of treatment</b>	<b>0.7%</b>	<b>1.7%</b>	<b>2.3</b>	<b>0.2-26.5</b>
<b>2 month f-u</b>	<b>2.3%</b>	<b>6.0%</b>	<b>2.7</b>	<b>0.7-11.1</b>
<b>6 month f-u</b>	<b>3.2%</b>	<b>5.3%</b>	<b>1.6</b>	<b>0.5-6.2</b>
<b>12 month f-u</b>	<b>4.4%</b>	<b>8.7%</b>	<b>2.0</b>	<b>0.6-6.4</b>

## (7) Day Point Prevalence Abstinence

<u>TIME</u>	<u>SC</u>	<u>MI</u>	<u>O.R</u>	<u>95% C.I.</u>
<b>End of treatment</b>	<b>7.9%</b>	<b>9.3%</b>	<b>1.2</b>	<b>0.5-2.9</b>
<b>2 month f-u</b>	<b>9.6%</b>	<b>9.5%</b>	<b>0.9</b>	<b>0.4-2.3</b>
<b>6 month f-u</b>	<b>10.3%</b>	<b>11.3%</b>	<b>1.1</b>	<b>0.4-2.5</b>
<b>12 month f-u</b>	<b>8.7%</b>	<b>12.5%</b>	<b>1.5</b>	<b>0.6-3.6</b>

## Impact = Treatment Efficacy X Population Reach

Intervention Type	Efficacy (% Quit)	Reach (% pop)	Impact (10(ExR))
Ideal Intervention	100%	100%	1.00
Reactive: Clinical Tx + pharmacological	30-40%	3-5%	.09-.20
Proactive: primary care/dental + pharmacological	10-20%	10-30%	.10-.60
Project CARES	12.5%	30%	.38

(Abrams, et al., 1996; Borrelli et al., 2005)

# Reducing SHSe in Children with Asthma

- 40% of children are exposed to SHSe in the home (Homa et al., 2015)
- 47% of kids with asthma live in multiple-smoker households (Borrelli et al., 2014)
- Higher SHSe related to greater asthma functional morbidity (Fedele, Tooley, Busch, McQuaid, Hammond & Borrelli, 2015).
- Studies addressing only SHSe reduction:
  - parents remain smokers
  - SHSe is sustained
  - Risk of children smoking
- Combination of SHSe reduction and smoking cessation:  
less effective (Rosen et al., 2012; 2014).
- Focused on parental smoking cessation



# Rationale for the Study

- Utilize a teachable moment to motivate parents to quit smoking.
- Raise awareness of the risks of smoking to themselves.
- Raise awareness of the multiple effects of SHSe on children's asthma:
  - Increased risk for developing asthma
  - Decreased lung function
  - Increased asthma symptoms
  - Increased utilization of medical services
  - Increased medication use



# Smokers with Asthmatic Children

## BAM

- Problem Solving
- Coping Skills
- Goal setting
- Reinforcement
- Didactic & Educational

## PAM

- Increase risk perception of smoking to self and child
- Biomarker feedback
  - CO
  - Second hand smoke exposure
- Motivational interviewing

## Mediator

- Self efficacy

- 3 home visits
- 30-45 minutes
- Follow-up call

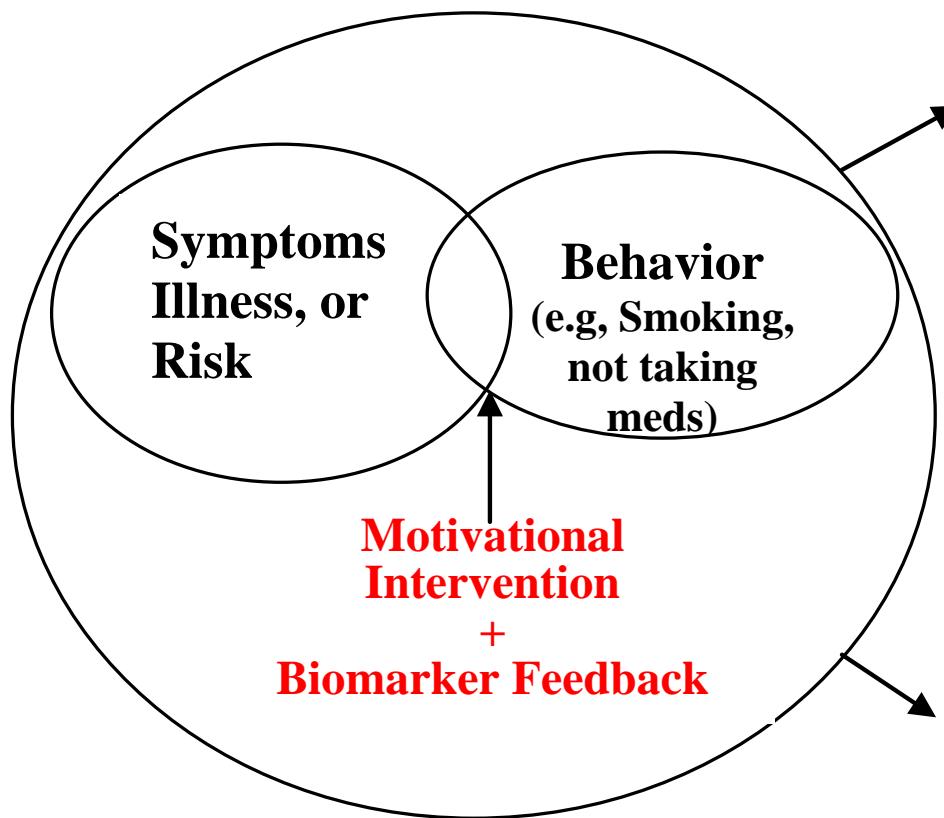
## Mediator

- Risk perception

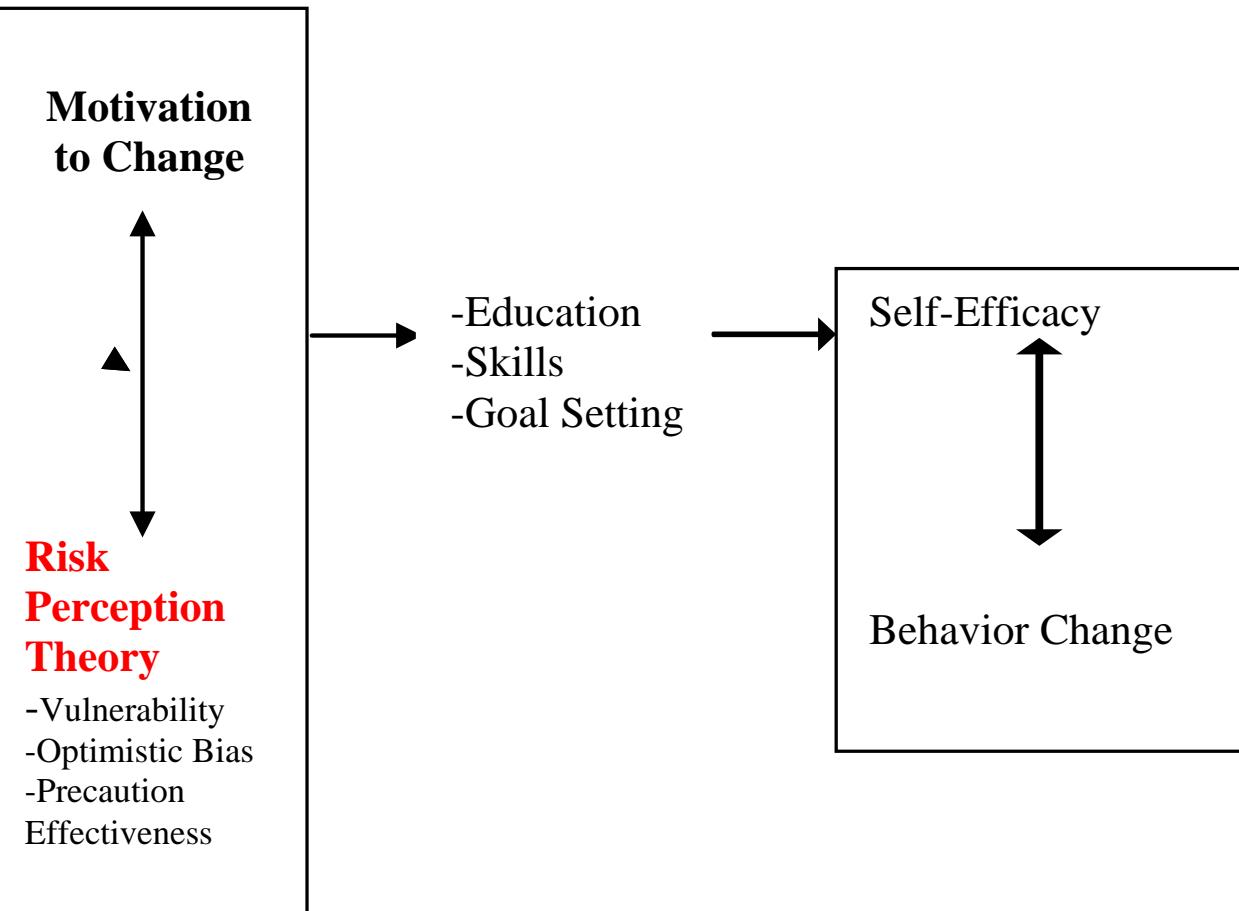
**Primary Outcomes: Quit smoking, SHS reduction**  
**Secondary Outcomes: Asthma Morbidity**

## Teachable Moment and Biomarker Feedback

### Motivational Phase Connecting Illness/Risk of Illness to Behavior



### Action Phase



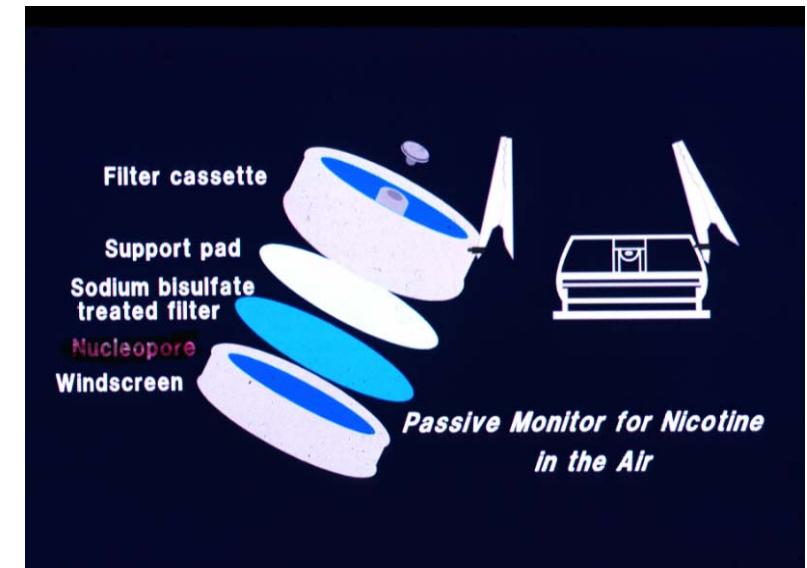
# Intervention Mapping: Precaution Adoption Process Model

	<b>Stage 1: Has heard of hazard</b>	<b>Stage 2: Believes that hazard poses risk to others</b>	<b>Stage 3: Believes that hazard poses personal risk</b>	<b>Stage 4: Decides to take action (Intention only)</b>	<b>Stage 5: Takes Precaution</b>
<b>Examples</b>	I have heard that giving my child soda causes cavities.	Other children drink lots of soda and their teeth are affected	Soda consumption is bad for my child's oral health	I have plans to stop purchasing soda for my family.	I have stopped purchasing soda for my family.
<b>Mediators of stage movement</b>	Knowledge of risks	Reduction of optimistic bias	Cost/benefits of soda consumption; personal vulnerability.	Beliefs about seriousness of threat (severity) Precaution effectiveness; contextual factors	Complexity of precaution Ease of change Cost of precaution adoption
<b>Intervention components</b>	Communication about the hazard.	Personalized risk information about how soda consumption may be affecting their child	Risk factor information for self. Motivational Interviewing techniques to reduce counterarguing and belief perseverance.	Self-efficacy enhancement Problem solving Barriers counseling Family counseling	

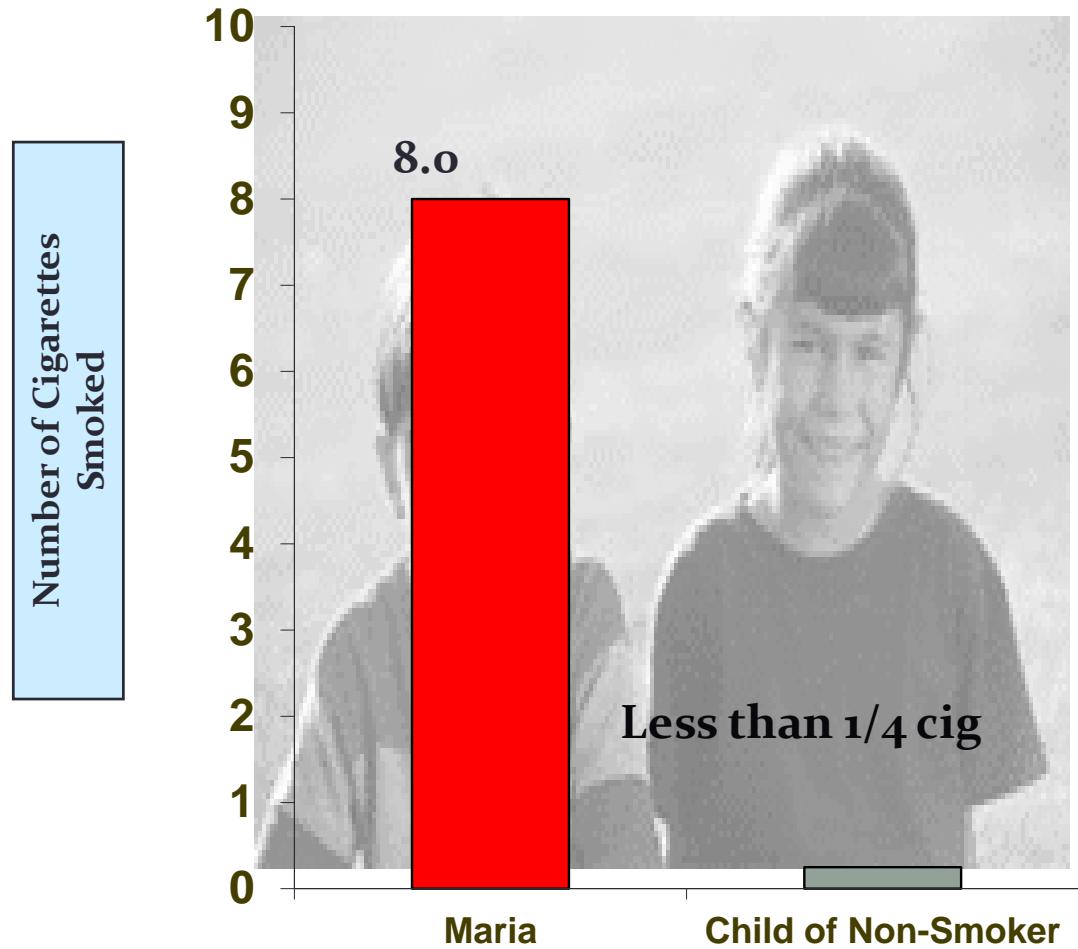
# Feedback on Secondhand Smoke Exposure

- Passive nicotine monitors utilize nicotine as a tracer for SHS
- Nicotine, a weak base, passively diffuses into the filter treated with sodium bisulfate, a weak acid, forming a stable salt.
- Analyzed by gas chromatography with nitrogen selective detection
- Home & child monitors placed for one week.

Hammond et al., 1995; Hammond and Leaderer, 1987

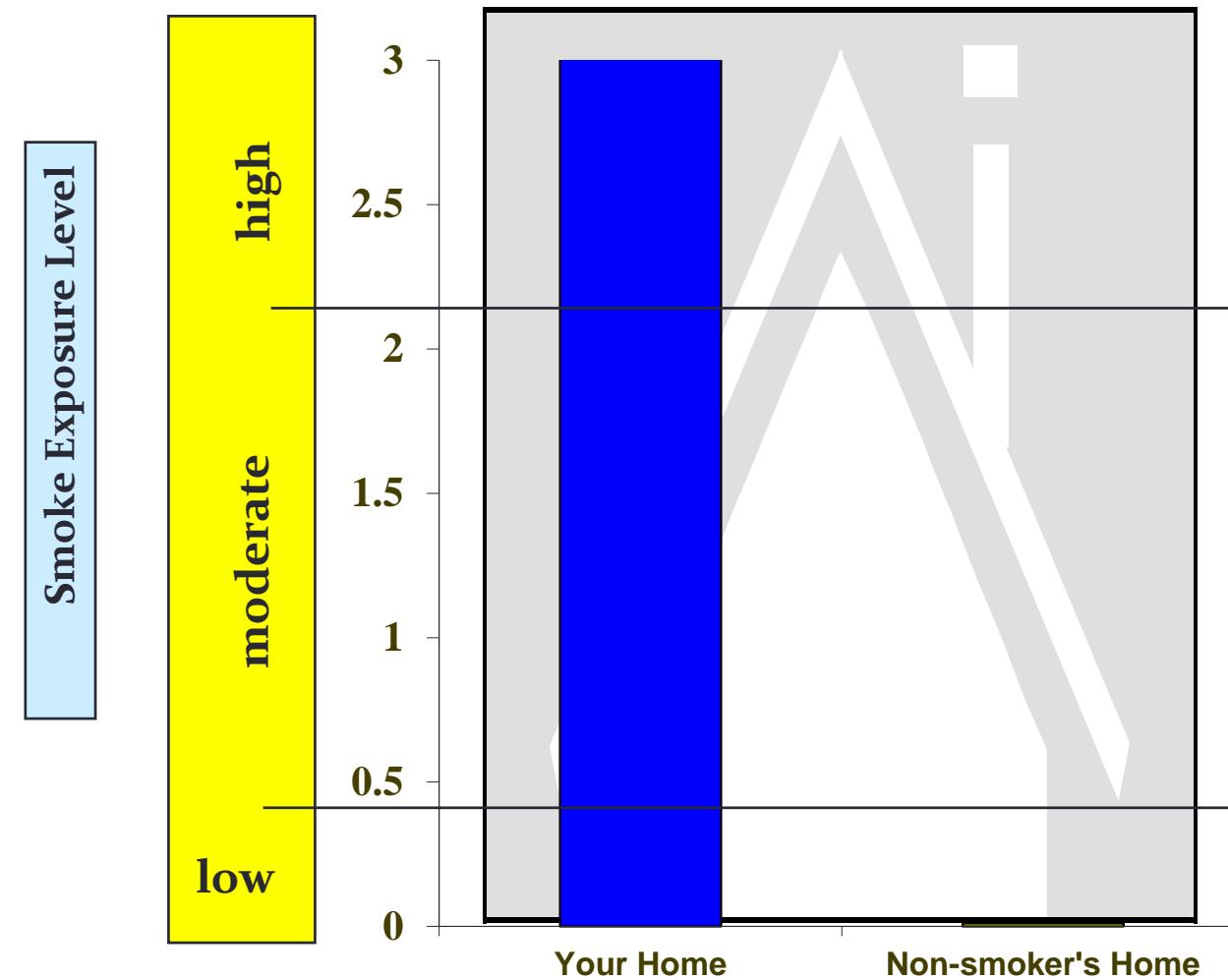


## Sampler Results - Maria



Maria breathed in as much smoke as if she smoked eight cigarettes the week that the sampler was placed.

## Sampler Results: Your Home



The level of smoke in your home usually reached very high levels, compared to a non-smoker's home.



## PAQS Study Outcomes

**PAQS**  
**Latino**

<u>TIME</u>	<u>BAM</u>	<u>PAM</u>	<u>O.R</u>	<u>95% C.I.</u>	<u>Cohen's d</u>
<b>2 month post-tx</b>	<b>9.2%</b>	<b>20.5%</b>	<b>2.54</b>	<b>.91-7.10</b>	<b>.32</b>
<b>3 months post-tx</b>	<b>12.3%</b>	<b>19.1%</b>	<b>1.68</b>	<b>.64-4.37</b>	<b>.18</b>

**PAQS**

<u>TIME</u>	<u>BAM</u>	<u>PAM</u>	<u>O.R</u>	<u>95% C.I.</u>
<b>2 month f-u</b>	<b>9.7%</b>	<b>20.2%</b>	<b>2.36</b>	<b>1.0-5.43*</b>
<b>6 month f-u</b>	<b>6.5%</b>	<b>8.5%</b>	<b>1.4</b>	<b>0.4-4.0</b>
<b>12 month f-u</b>	<b>4.3%</b>	<b>11.7%</b>	<b>2.9</b>	<b>0.9-9.6 p=.07</b>



## Intensity Hypothesis

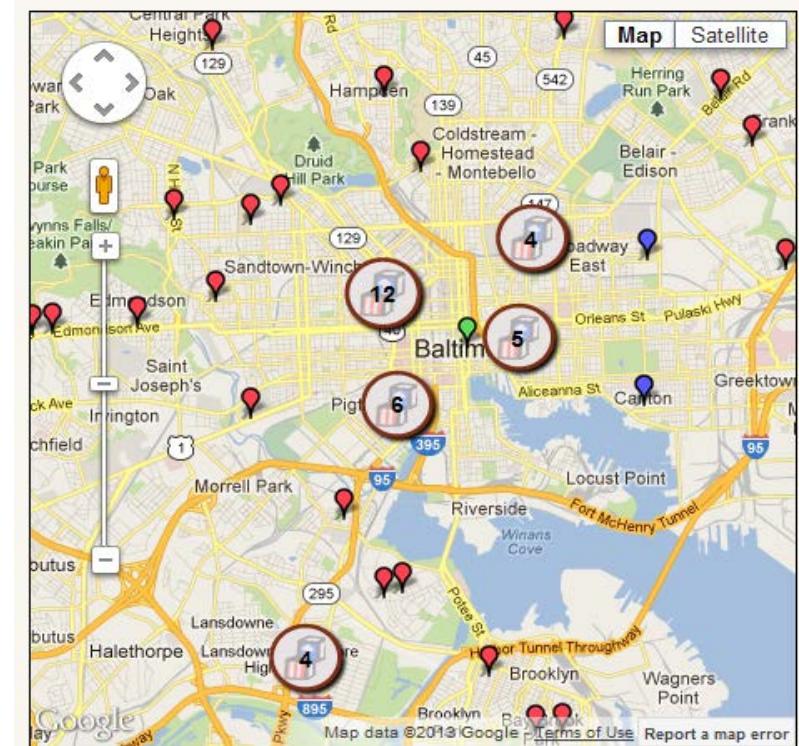
- Additional phone counseling + biomarker feedback:
  - Doubled smoking cessation rates (18.2% vs. 9.9%) (OR=2.12, 95% CI =1.09-4.12)
  - Resulted in better child asthma outcomes
    - 81% lower odds of hospitalization for asthma (OR=.19, 95% CI .04-.89)
    - 52% lower odds of missed school due to asthma (OR=.48, 95% CI .24-.98).
    - 39% lower odds of asthma symptoms (OR=.61, 95% CI .39-.96)

NHLBI R01 062165

Borrelli, McQuaid et al., 2016, *Addiction*

# Dissemination of PAQS

- 16 Baltimore City Head Start Programs
- n=330, Randomized to Education vs. PAQS
- 93% African American
- At 12 months post-intervention, the PAQS group:
  - Lower household air nicotine levels
  - More household smoking bans
  - Lower child salivary cotinine among those with household smoking bans
  - MI resulted in significant cost savings from averted ED visits
    - (\$4,410 SI: \$2241-\$6626)



# Teachable Moment

- Naturally occurring life transitions or health events that have the potential to motivate people to adopt risk reducing health behaviors.
- People may be more receptive to health risk messages because of the context of more heightened awareness regarding their health.
- Naturally occurring event primes the individual to consider change.
- Low cost widely disseminable interventions tip the balance in favor of change.



## PAQS 3: Teachable Moment Results

Parents of children with asthma achieved greater cessation vs. parents of Healthy Children after receiving identical biomarker feedback interventions.

	Asthma	Healthy	OR	95% CI
7 day ppa	14.6%	6.4%	2.26	1.13-4.51
30 day ppa	12.9%	5.0%	2.60	1.22-5.54



# ACTIVE BEHAVIORS FOR LIVING EMPOWERED

**Program for Smokers with Mobility Impairments**

Belinda Borrelli, PhD  
Rosemary Hughes, PhD  
Andrew Busch, PhD  
Shira Dunsiger, PhD  
Patricia Risica, PhD  
Tom Lasater, PhD



NIH R01 NCI 137616 to B. Borrelli

# INTEGRATING INTERACTIVE PARENT TEXT MESSAGING AND ORAL HEALTH GUIDELINES INTO PEDIATRIC COMMUNITY HEALTH CENTERS TO REDUCE ECC AMONG URBAN CHILDREN

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Funded by NIDCR



# Key Priorities for Theory and Health Behavior Change

- Discover new theories:
  - De novo
  - Determine if existing theories are applicable to, and valid for, the target behavior
- Build on mechanisms research to more accurately pinpoint targets of change.
- Theory is especially important for diverse populations
  - Determinants of health behaviors vary across ethnic groups.

Thank you!

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# Acknowledgements

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