MOTIVATING SMOKERS TO QUIT:
THEORY, INTERVENTION COMPONENTS
AND TIMING MATTER

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Conflicts

• I have no conflicts to declare
Smoking Cessation

• Prevalence of smoking is 15% (42 million) in the US \( \text{CDC, 2015} \)
  • GEDs: 41% smoke \( \text{CDC, 2014} \).
  • Mobility impairments: 35% smoke \( \text{Borrelli, Busch & Dunsiger, 2014} \).
  • Mental illness: 36% smoke \( \text{CDC 2014} \).

• The vast majority of smokers are not ready to quit smoking within 30 days

• Treatments are designed for those who are ready to quit smoking
  • 12% of smokers
Smokers who are not motivated to quit

• WHO are they?

• WHERE can you find them? (reach)

• WHEN is the best time to intervene?

• WHAT treatments are effective?

• WHY are these treatments effective? (mechanisms)
Two types of unmotivated smokers

- “Wild type” smoker
  - Proactively reach through channels
  - Unlikely to spontaneously seek cessation services
  - Vary in their motivation levels

- Unmotivated smokers—target directly
Smokers who are not motivated to quit

• WHO are they?

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• WHEN is the best time to intervene?

• WHAT treatments are effective?

• WHY are these treatments effective? (mechanisms)
Subtypes of Smokers who are Unmotivated to Quit

• AIM: To use Latent Class Analysis to examine whether distinct subgroups of unmotivated smokers can be empirically derived.
  • Demographic, psychosocial, smoking behavior variables

• Online survey of 500 Smokers in the US and UK

• Inclusion:
  • ≥ 3 cigarettes per day
  • ≥ 100 cigarettes in their lifetime
  • ≥ 18 years old
  • Not motivated to quit smoking within 30 days.

Borrelli, Gaynor, Tooley, Wearden, Armitage, & Bartlett, under review
Funded by Cancer Research UK & The Miriam Hospital
### Variables showing significant differences between all three classes: HCS vs. SPB, HCS vs. UCS and SPB vs. UCS

<table>
<thead>
<tr>
<th>HCS: Health Concerned Smokers (n = 166)</th>
<th>SPB: Smokers with Psychosocial Barriers (n = 192)</th>
<th>UCS: Unconvinced smokers (n = 142)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past smoking related illnesses</td>
<td>Have a partner</td>
<td>Unemployed</td>
</tr>
<tr>
<td>Perceived vulnerability for developing smoking-related illnesses</td>
<td>Partner smokes (90.6%)</td>
<td>Never made a quit attempt</td>
</tr>
<tr>
<td>Motivated to quit smoking</td>
<td>Multiple smokers in the home</td>
<td>No past year quit attempts</td>
</tr>
<tr>
<td></td>
<td>Children at home</td>
<td>Not motivated to quit</td>
</tr>
</tbody>
</table>

#### Significant differences between HCS and SPB vs. UCS

- HCS and SPB (vs. UCS)
  - More likely to believe that smoking cessation can reduce the risks associated with smoking
  - Confident to quit smoking
  - Twice as likely to be depressed

Unmotivated Smokers are not a homogenous group
Variables showing significant differences between all three classes:
HCS vs. SPB, HCS vs. UCS and SPB vs. UCS

**HCS: Health Concerned Smokers** (n = 166)
- Past smoking related illnesses
- Perceived vulnerability for developing smoking-related illnesses
- Motivated to quit smoking

**SPB: Smokers with Psychosocial Barriers** (n = 192)
- Have a partner
- Partner smokes (90.6%)
- Multiple smokers in the home
- Children at home

**UCS: Unconvinced smokers** (n = 142)
- Unemployed
- Never made a quit attempt
- No past year quit attempts
- Not motivated to quit
- Low perceived vulnerability for smoking related illnesses
- Optimistically biased regarding smoking risks
- No children in home
- Not nicotine dependent

### Significant differences between HCS and SPB vs. UCS

**HCS and SPB (vs. UCS)**
- More likely to believe that smoking cessation can reduce the risks associated with smoking
- Confident to quit smoking
- Twice as likely to be depressed

### Plans to quit

<table>
<thead>
<tr>
<th></th>
<th>HCS</th>
<th>SPB</th>
<th>UCS</th>
<th>HCS vs. SPB</th>
<th>HCS vs. UCS</th>
<th>SPB vs. UCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never see themselves quitting</td>
<td>22.4%</td>
<td>31.8%</td>
<td>60.6%</td>
<td>3.56 (p=0.03)</td>
<td>45.16 (p&lt;0.001)</td>
<td>26.30 (p&lt;0.001)</td>
</tr>
<tr>
<td>Plan to quit within a year</td>
<td>75.2%</td>
<td>62.6%</td>
<td>46.4%</td>
<td>4.24 (p=0.02)</td>
<td>13.25 (p&lt;0.001)</td>
<td>3.57 (p=0.03)</td>
</tr>
</tbody>
</table>
Smokers who are not motivated to quit:

- WHO are they?
- WHERE can you find them? (reach)
- WHEN is the best time to intervene?
- WHAT treatments are effective?
- WHY are these treatments effective? (mechanisms)
Home Care as a Channel for Intervention

- 76% of smokers who quit while in the hospital relapse upon discharge.
- Over 1/3 of home health care patients have smoking-related illnesses. Many more have illnesses that are exacerbated by smoking.
- Access underserved, and minority populations
- Proactive reach (175,000 visits/year)
- Intervention coincides with teachable moment
- Best practice guidelines:
  - Continuity of care and social support
  - Multiple contacts over time are most effective
Home Health Care Nurses as a New Channel For Motivating Smokers to Quit

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

Funded by R01 CA74553  Borrelli, Novak, et al. (2005) Preventive Medicine
Intervention: Provide CO level, discussion of symptoms, and how the body repairs itself after quitting.
Participants

11.8% Smokers on VNA Service
83% Referred by Nurse (N=484)
82% Screened by Project (N=399)

70% Enrolled N=273
23% Ineligible N=92
7% Eligible but Refused to Participate N=29
Enrolled Participants

- \( N = 273 \)
- Age: \( M = 57 \) (SD = 14.3; range = 21-89, mode = 58)
- Gender: 54% females
- Marital Status: 27% married, 22% widowed
- Ethnicity: 60% white
- < high school education: 41%
- Unemployed: 91%
- \( CESD \ M = 21.4; (SD = 12.5) \)
## Average Reduction in Daily Cigarette Consumption

<table>
<thead>
<tr>
<th>Condition</th>
<th>End of TX M, SD</th>
<th>2 month M, SD</th>
<th>6 month M, SD</th>
<th>12 month M, SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>-3.8 (.84)</td>
<td>-4.1 (1.04)</td>
<td>-3.1 (1.06)</td>
<td>-3.2 (1.2)</td>
</tr>
<tr>
<td>MI</td>
<td>-6.9 (.93)</td>
<td>-7.5 (1.13)</td>
<td>-6.3 (1.10)</td>
<td>-7.8 (1.4)</td>
</tr>
</tbody>
</table>

* all $p < .05$
### Continuous Abstinence

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

### (7) Day Point Prevalence Abstinence

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

### Impact = Treatment Efficacy X Population Reach

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

(Abrams, et al., 1996; Borrelli et al., 2005)
Smokers who are not motivated to quit:

- WHO are they?
- WHERE can you find them? (reach)
- WHEN is the best time to intervene?
- WHAT treatments are effective?
- WHY are these treatments effective? (mechanisms)
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.

McBride, Emmons & Lipkus, 2003
Borrelli et al., in press, *Addiction*
• AIM: Parents who smoke and had a child with asthma would achieve greater smoking cessation vs. parents of a healthy child after receiving identical biomarker feedback interventions.

Funded by R01 HL062165-06
Borrelli, McQuaid et al., in press, *Addiction*
Inclusion Criteria

**Parents**
- Primary caregiver
- Current, regular smoker
- Child age 3-17

**Children with Asthma**
- Child with diagnosis of asthma
- Asthma exacerbation necessitating either:
  - Emergency Room visit
  - Urgent Care visit
  - Hospitalization

**Healthy Children**
No children in the household who:
- Have a diagnosis of asthma or other significant pulmonary disease
- Were hospitalized in the past year for acute respiratory illness
Inclusion Criteria

### Parents
- Primary caregiver
- Current, regular smoker
- Child age 3-17

### Children with Asthma
- Child with diagnosis of asthma
- Asthma exacerbation necessitating either:
  - Emergency Room visit
  - Urgent Care visit
  - Hospitalization

### Healthy Children
No children in the household who:
- Have a diagnosis of asthma or other significant pulmonary disease
- Were hospitalized in the past year for acute respiratory illness

Teachable Moment
Perceived Vulnerability

Precaution Effectiveness

20 minutes after:
- Blood pressure and heart rate drop to normal
- Body temperature of hands and feet increases to normal

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

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

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.

* Geriatrics, April 1993, Vol. 48(4)
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
Maria breathed in as much smoke as if she smoked eight cigarettes the week that the sampler was placed.

The level of smoke in your home usually reached very high levels, compared to a non-smoker’s home.
Parents of children with asthma achieved greater cessation vs. parents of Healthy Children after receiving identical biomarker feedback interventions.

<table>
<thead>
<tr>
<th></th>
<th>Asthma</th>
<th>Healthy</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 day ppa</td>
<td>14.6%</td>
<td>6.4%</td>
<td>2.26</td>
<td>1.13-4.51</td>
</tr>
<tr>
<td>30 day ppa</td>
<td>12.9%</td>
<td>5.0%</td>
<td>2.60</td>
<td>1.22-5.54</td>
</tr>
</tbody>
</table>

Funded by R01 HL062165-06
Borrelli, McQuaid et al., in press, *Addiction*
Objectively Measured SHSe: % of home and child monitors with detectable levels
PAQS 3: Teachable Moment Results

- Secondary Aim
  - Greater intervention intensity potentiates teachable moment effect.

<table>
<thead>
<tr>
<th></th>
<th>Asthma-Enhanced Intensity</th>
<th>Healthy</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 day ppa</td>
<td>18.2%</td>
<td>6.4%</td>
<td>2.88</td>
<td>1.45-5.69</td>
</tr>
<tr>
<td>30 day ppa</td>
<td>17.7%</td>
<td>5.0%</td>
<td>3.60</td>
<td>1.72-7.55</td>
</tr>
</tbody>
</table>
Smokers who are not motivated to quit:

• WHO are they?

• WHERE can you find them? (reach)

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• WHAT treatments are effective?

• WHY are these treatments effective? (mechanisms)
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

**Mediator**
- Risk perception

**Primary Outcomes:** Quit smoking, SHS reduction

**Secondary Outcomes:** Asthma Morbidity

Funded by The Robert Wood Johnson Fdn and NHLBI R01 HL62165 & R01 HL062165-06 to B. Borrelli
PAQS Study Outcomes

**PAQS Latino**
n=133

<table>
<thead>
<tr>
<th>TIME</th>
<th>BAM</th>
<th>PAM</th>
<th>O.R</th>
<th>95% C.I.</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 month post-tx</td>
<td>9.2%</td>
<td>20.5%</td>
<td>2.54</td>
<td>.91-7.10</td>
<td>.32</td>
</tr>
<tr>
<td>3 months post-tx</td>
<td>12.3%</td>
<td>19.1%</td>
<td>1.68</td>
<td>.64-4.37</td>
<td>.18</td>
</tr>
</tbody>
</table>

**PAQS**
n=188

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

Borrelli, et al., JCCP 2010; Borrelli et al., 2009; Funded by The Robert Wood Johnson Fdn & NHLBI
PAQS 3: Intensity Hypothesis (Asthma Only)

- Greater quit rates at follow-up with greater intervention intensity (repeated biomarker feedback).

<table>
<thead>
<tr>
<th></th>
<th>4 month f-u</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Enhanced PAM</td>
<td>PAM</td>
<td>OR</td>
<td>95% CI</td>
<td></td>
</tr>
<tr>
<td>7 day</td>
<td>15.9%</td>
<td>10.5%</td>
<td>1.27</td>
<td>0.71-2.29</td>
<td></td>
</tr>
<tr>
<td>30 day</td>
<td>18.2%</td>
<td>9.9%</td>
<td>2.12</td>
<td>1.09-4.12</td>
<td></td>
</tr>
</tbody>
</table>

NHLBI R01 062165
Borrelli, McQuaid et al., in press, *Addiction*
PAQS 3: Intensity Hypothesis (Asthma Only)

- Significant effect dissipates over time

<table>
<thead>
<tr>
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<th>Enhanced-PAM</th>
<th>PAM</th>
<th>OR</th>
<th>95% CI</th>
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<tbody>
<tr>
<td><strong>7 day ppa</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 month f-u</td>
<td>13.5%</td>
<td>9.9%</td>
<td>1.53</td>
<td>0.76-3.05</td>
</tr>
<tr>
<td>12 month f-u</td>
<td>14.7%</td>
<td>13.4%</td>
<td>1.09</td>
<td>0.58-2.04</td>
</tr>
</tbody>
</table>

<table>
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<tr>
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<th>OR</th>
<th>95% CI</th>
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<tr>
<td><strong>30 day</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 month f-u</td>
<td>14.1%</td>
<td>12.9%</td>
<td>1.06</td>
<td>0.56-2.02</td>
</tr>
<tr>
<td>12 month f-u</td>
<td>19.4%</td>
<td>13.5%</td>
<td>1.48</td>
<td>0.71-2.93</td>
</tr>
</tbody>
</table>
Motivation to quit by treatment groups by time interaction

OR = 2.67, p=0.10
OR = 2.40, p=0.03

Borrelli & Endrighi, in preparation.
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)

Jassal, Riekert, Borrelli, Rand, & Eakin (2016), *Nicotine & Tobacco Research.*
Smokers who are not motivated to quit:

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- WHAT treatments are effective?

- WHY are these treatments effective? (mechanisms)
Teachable Moment and Biomarker Feedback

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

- Symptoms Illness, or Risk
- Behavior (e.g., Smoking, not taking meds)
- Motivational Intervention + Biomarker Feedback

**Risk Perception Theory**
- Vulnerability
- Optimistic Bias
- Precaution Effectiveness

**Action Phase**

- Education
- Skills
- Goal Setting

Self-Efficacy

Behavior Change
Risk Perception

Pam vs. Healthy
PV Child OB Child PE Child
Motivation to Quit
Bio verified 7 day PPA

\[ a(PV \text{ Child}) = 0.61(0.39), \quad p = 0.12 \]
\[ a(\text{OB Child}) = 0.24(0.44), \quad p = 0.59 \]
\[ a(\text{PE Child}) = 1.13(0.40), \quad p = 0.01 \]

\[ b(PV \text{ Child}) = 0.04(0.04), \quad p = 0.28 \]
\[ b(\text{OB Child}) = -0.05(0.03), \quad p = 0.06 \]
\[ b(\text{PE Child}) = 0.08(0.03), \quad p = 0.03 \]

\[ c = -0.11(0.20), \quad p = 0.57 \]

\[ \text{OR} = 2.21, \quad 95\% \text{ CI: 1.40-3.47} \]
The Role of Risk Perception Theory in Medically ill Smokers

Longitudinal Analyses

ΔPerceived Vulnerability → Continuous abstinence
(OR=3.16, 95% CI: 1.16-8.57)

Smoking-related illness X Optimistic Bias → Smoking
(OR=0.25, 95% CI: 0.68-0.93)

Smoking-related illness X Precaution Effectiveness → Continuous abstinence
(OR=12.94, 95% CI: 0.987-167)

Conclusions: Jump Start Health Behavior Change

1. New Channels of Delivery/Integrate into Existing infrastructures—include unmotivated smokers in trials.

2. Novel Methods (mHealth, Biomarker feedback, cultural adaptation of txs)

3. Focus on Mechanisms

4. Teachable Moment

Motivate Health Behavior Change
Acknowledgements

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- Christopher Armitage

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- Erin Tooley
- Sheila Gaynor
- Ted Wagener
- Kiera Bartlett
- Carolyn Black Becker
- Ashley Hum Clawson
- Andrew Busch
- Deborah Sepinwall
- David Trotter
- Jeanne Esler
- Anna Schiebel Scherr
- Pam Steadman
- Brittany Brothers
- Karl Chiang
- Rashelle Hayes
- Kristin Gregor
- Brian Hitsman
Enhanced PAM had better asthma outcomes vs. PAM

<table>
<thead>
<tr>
<th>Time Point</th>
<th>Hospitalization for asthma during the study</th>
<th>Missed School due to asthma</th>
<th>Odds of &gt;=1 day with asthma sx s</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 month f-u</td>
<td>-----</td>
<td>OR=.52 95% CI: .26-1.00</td>
<td>ns</td>
</tr>
<tr>
<td>4 month f-u</td>
<td>-----</td>
<td>OR=.48 95%CI .24-.95</td>
<td>ns</td>
</tr>
<tr>
<td>6 month f-u</td>
<td>OR=.19 95% CI: .04-.89</td>
<td>OR=.48 95%CI .24-.98</td>
<td>OR=.61 95%CI : .39-.96</td>
</tr>
</tbody>
</table>
Conclusions

- Only 40-45% of participants in our samples were motivated to change.
- Use a “foot in the door approach”
- Weave intervention into their daily lives.
- Patient centered approaches work best.
- Use theory to increase translative power.
Risk Perception

Enhanced-PAM vs. PAM

PV Child
OB Child
PE Child
Confidence

Bio verified 7 day PPA

\(a\text{(PV Child)}=.70(.49), p=.15\)
\(a\text{(OB Child)}=.06(.52), p=.90\)
\(a\text{(PE Child)}=.01(.50), p=.98\)
\(a\text{(confidence)}=7.75(3.60), p=.03\)
\(b\text{(PV Child)}=.14(.09), p=.09\)
\(b\text{(OB Child)}=.02(.05), p=.76\)
\(b\text{(PE Child)}=.11(.08), p=.19\)
\(b\text{(confidence)}=.06(.01), p<.01\)

\(c=.42(.37), p=.26\)

\(ab\text{(confidence)}=.43(.26), 95\% \text{ CI:.002-.97}\)
PAQS: Financial Return on Investment (ROI)

Analysis of Claims Data

ROI:
Children < six years old (+106.9%)
Children 6-18 Years (-150.3%)
Mod/severe asthma (+6.9%)

Medication Use:
Significant increase

McQuaid, Garro, Seifer, Hammond & Borrelli,
*Pediatric Pulmonology*, 2012
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
## Intervention Design

<table>
<thead>
<tr>
<th>All Groups</th>
<th>Healthy</th>
<th>Asthma</th>
<th>Enhanced-Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two home visits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Motivational Interviewing for smoking cessation</td>
<td>+Child Wellness</td>
<td>+Asthma education</td>
<td>+Asthma Education</td>
</tr>
<tr>
<td>• CO feedback</td>
<td>+Contact control calls (child wellness content)</td>
<td>+Contact control calls (asthma content)</td>
<td>+Repeated biomarker feedback</td>
</tr>
<tr>
<td>• SHSe feedback</td>
<td></td>
<td></td>
<td>+Smoking cessation counseling calls</td>
</tr>
</tbody>
</table>
### PAQS 3: Intervention Design

**Motivating and Sustaining Quitting**

<table>
<thead>
<tr>
<th>Both Groups</th>
<th>PAM</th>
<th>Enhanced PAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two home visits</td>
<td>+Asthma education +Six contact control calls (asthma content)</td>
<td>+Asthma Education +Repeated biomarker feedback +Six smoking cessation counseling calls</td>
</tr>
<tr>
<td>• Motivational Interviewing for smoking cessation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CO feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• SHSe feedback</td>
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</tr>
</tbody>
</table>

Funded by R01 HL062165-06
Borrelli, McQuaid et al., in press, *Addiction*
## Intervention Design

<table>
<thead>
<tr>
<th>All Groups</th>
<th>Parents of Healthy Kids</th>
<th>Parents of Kids with Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two home visits</td>
<td>+Child Wellness content</td>
<td>+Asthma education content</td>
</tr>
<tr>
<td>• Motivational Interviewing for smoking cessation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CO feedback</td>
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</tr>
<tr>
<td>• SHSe feedback</td>
<td></td>
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</tbody>
</table>