Motivating parents of kids with asthma to quit smoking: the PAQS project

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Abstract

The Parents of Asthmatics Quit Smoking (PAQS) project contrasts two theory-based smoking cessation interventions for parents of children with asthma, and compares mechanisms of behavior change within and across theoretical perspectives. We hypothesize that enhancing the perception of risk to self and child will motivate smoking cessation more than standard approaches that emphasize building self-efficacy and coping skills for quitting in a population that is largely not motivated to quit smoking. Smokers (n = 288) and their asthmatic children who receive nurse-delivered in-home asthma education (as part of the insurance carrier’s standard of care) are randomized into one of two treatment conditions: (1) the Behavioral Action Model (BAM), in which nurses emphasize goal setting and skill building to enhance self-efficacy to quit smoking, or 2) the Precaution Adoption Model (PAM), in which nurses tailor the intervention to the smoker’s readiness to quit and incorporate biomarker feedback [i.e. level of carbon monoxide exposure to the smoker and level of environmental tobacco smoke (ETS) exposure to the child] in order to increase risk perception in smokers. In both conditions, smokers who are ready to quit receive the nicotine patch. Analyses will examine (1) quit rates, ETS level and motivation to quit as the primary dependent variables, (2) mediators of behavior change between and within conditions, and (3) relations between parent smoking outcomes and child asthma morbidity (i.e. ER visits and asthma symptoms) post-treatment. Results will help tailor interventions to this population, and identify mechanisms of behavior change that result in adaptive health outcomes for smokers and their children who have asthma.

Introduction

Smoking is the leading cause of preventable morbidity and mortality. Approximately 25% of Americans continue to smoke (Centers for Disease Control, 1999), with greater prevalence among minorities, those below the poverty level and those who have not completed high school (Centers for Disease Control, 1994; King et al., 1997). Smoking affects the health and quality of life of not only the smoker, but also those in their environment. In 1992, the Environmental Protection Agency concluded that environmental tobacco smoke (ETS) presents a serious and substantial public health risk. Over 4000 chemicals have been identified in cigarette smoke, 40 of which are known to be carcinogenic. In the US, approximately 50–67% of children under the age of 5 live in homes with at least one adult smoker (Cummings...
et al., 1990), placing them at greater risk for a variety of illnesses, including asthma. Children who are exposed to ETS have a higher than average risk of developing asthma (Environmental Protection Agency, 1992), impaired recovery after hospitalization for an acute asthma exacerbation (Albuohon et al., 1997), use more asthma medications (Weitzman et al., 1990) and use emergency services more frequently (Evans et al., 1987) than children who are not exposed to ETS.

Asthma has now become the most common pediatric chronic illness in the US, affecting an estimated 4.8 million children (Centers for Disease Control, 1996). The US is one of the few countries where asthma severity and mortality are related to poverty (Platt-Mills, 1997) and race. In 1995, the age-adjusted mortality rate for asthma in the African-American population was almost three times the rate in the Caucasian population (Centers for Disease Control, 1996). Some have proposed that the disproportionate impact of asthma on minority populations may be due to greater exposure to indoor allergens (e.g. dust mites and cockroaches) in urban areas, which tend to have greater concentrations of minorities (Evans, 1992). Since the prevalence of smoking is also higher among minorities and those below the poverty line (Centers for Disease Control, 1994; King et al., 1997), these children and their parents are also at greater risk for morbidity and mortality from smoking.

The Parents of Asthmatics Quit Smoking (PAQS) project aims to compare two theoretical models, both within an overarching social cognitive framework, in their ability to predict both short- and long-term behavior changes in smokers whose children have asthma. Specifically, the goals of the project are to (1) assess quit rates, ETS levels and changes in motivation to quit between treatment groups over time, (2) determine the strength of hypothesized mediators of behavior change between and within each condition, and (3) examine relations between parental smoking outcome and child’s asthma morbidity (i.e. ER visits and asthma symptoms).

### Study population

We are recruiting smokers who are the primary caregivers of children with asthma and who are receiving nurse-delivered home-asthma care and education services as part of their insurance carrier’s standard of care. All participants are members of Neighborhood Health Plan of Rhode Island (NHPRI), an insurance provider that covers over a third of families eligible for Rhode Island’s Medicaid managed care program. The majority of the population served by NHPRI is urban, low-income and ethnically diverse. As part of the NHPRI insurance plan, families who have children with asthma receive in-home asthma care and education (‘Breathe Easy’), delivered by a home health care nurse. The NHPRI Asthma Care Coordinator identifies families who are in need of asthma education through NHPRI claims data, patterns of health care utilization and physician referral.

In order to be eligible for PAQS, families must have a primary caregiver who smokes at least 3 cigarettes per day, is over 18 years of age, speaks English or Spanish and is not currently receiving treatment for smoking cessation. The child with asthma must be age 18 or younger. If there is more than one smoker in the family and both are considered to be primary caregivers, the smoker who spends the most time with the child will be included in the study. Although other smokers in the household will be given assistance with smoking cessation, they will not be included in the formal study. Families who are not eligible for the study (or who refuse to participate) will receive the same asthma education program, but without the smoking cessation component. We will have access to demographics and health care utilization of families who are not in the study in order to compare these characteristics to those of study participants.

Between May 2001 and May 2003, the NHPRI Asthma Care Coordinator will screen 900 families who have at least one child with asthma for enrollment into either our study (if eligible) or into the regular NHPRI asthma care and education
program (‘Breathe Easy’ without the smoking cessation component if ineligible or unwilling to participate in our study). We anticipate that 50% of those screened will be smokers (based on a prior NHPRI census), and 80% will be eligible and consent to participation in our study. Even with expected attrition, we anticipate that approximately 280–300 families will receive the intervention by May 2003. Families will be randomized to interventions using a random number computer program. Given that there is rolling admission to the study, the study period will end 12 months after the final subject completes the intervention, to allow for 2-, 6- and 12-month follow-up assessments.

**Design**

The study utilizes a two-group, randomized design to compare the efficacy of two theoretically based interventions for smoking cessation: the Behavioral Action Model (BAM), which is based on the Agency for Health Care Policy and Research (AHCPR) clinical guidelines for smoking cessation (Fiore et al., 2000) and emphasizes goal-setting and skill building to enhance self-efficacy to quit smoking, and the Precaution Adoption Model (PAM), which is tailored to the smoker’s readiness to quit and incorporates biomarker feedback [i.e. carbon monoxide (CO) level of the smoker, and level of ETS in the home and inhaled by the child] in order to increase risk perception of smoke exposure to self and child. Home health care nurses deliver one of these two smoking cessation interventions to the primary caregiver that spends the most time with the child who has asthma. Participants are usually seen for two asthma care and education visits, and cessation counseling begins in the middle of the second visit. Cessation counseling is the primary focus of a third visit, although additional asthma care and education may be required depending upon the child’s health status. While the asthma care and education are a regular part of the NHPRI membership benefits, the smoking cessation counseling component is added on to this existing treatment. The content and structure of the asthma education is the same for all patients regardless of cessation counseling condition. The total time spent discussing smoking over the course of the home visits, approximately 1.0–1.5 h, is the same for both conditions. Nurses also record the total time spent discussing smoking after each visit, so that we can assess degree of variability and the possible effects on outcome. Nurses are encouraged to complete all visits over a 2-month period. Participants in both conditions receive an additional 15-min follow-up phone call from their nurse in order to provide support for smoking cessation or to motivate quit attempts. Research staff blind to the treatment condition will conduct baseline and end of treatment assessments in the participant’s home, and the 2-, 6- and 12-month follow-up assessments over the telephone.

**Theoretical approach chosen**

Theories provide coherence to a health behavior intervention, guiding the search for modifiable factors (Hayes, 1998). Accordingly, an important aim of our study is to be able to determine not only which treatment is more efficacious in changing health behaviors, but also identifying the mechanism(s) of behavior change (i.e. why the treatment worked). The choice of theories, however, presented an enormous challenge since many current theories have overlapping constructs, mechanisms or measures, potentially producing significant overlap in intervention content.

Since we were unlikely to find two mutually exclusive theoretical models of health behavior change, we instead sought to compare two theories that emphasized two different constructs underneath a larger social cognitive umbrella: PAM, which emphasizes risk perception, and BAM, which emphasizes self-efficacy. We coined the name ‘BAM’ to identify that part of social cognitive theory that emphasizes building self-efficacy through problem solving, skill building and subgoal setting, thus largely following the AHCPR Clinical Guidelines for smoking cessation. Thus, it is a more ‘action-oriented’ approach, whereby it is assumed that the smoker is ready and willing to
Table I. Application of PAM to specific health hazards: smoking and ETS exposure

<table>
<thead>
<tr>
<th>PAM stage</th>
<th>Health hazard</th>
<th>ETS exposure</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Smoking</td>
<td>Banning household smoking</td>
</tr>
<tr>
<td>Hazard precaution</td>
<td>Smoking cessation</td>
<td>Unaware that ETS carries health risks</td>
</tr>
<tr>
<td>1. Unaware of hazard</td>
<td>Unaware that smoking carries health risks</td>
<td>Unaware that ETS carries health risks</td>
</tr>
<tr>
<td>2. Aware of hazard, never engaged by the issue</td>
<td>Aware of health risks of smoking, but has not considered implications of this risk to his/her life, has not considered quitting</td>
<td>Aware of health risks of ETS, but has not considered implications of this risk to family members, has not considered banning household smoking</td>
</tr>
<tr>
<td>3. Engaged by the issue, undecided about response</td>
<td>Aware of health risks of smoking, undecided about quitting</td>
<td>Aware of health risks of ETS, undecided about banning household smoking</td>
</tr>
<tr>
<td>3a. Engaged by the issue, currently grappling with decision to quit smoking</td>
<td>Currently grappling with decision to quit smoking</td>
<td>Currently grappling with decision to ban household smoking</td>
</tr>
<tr>
<td>3b. Considers taking action, but decides not to act</td>
<td>Considers quitting, but decides not to quit</td>
<td>Considers setting a ban, but decides not to do so</td>
</tr>
<tr>
<td>4. Considers taking action, intends to act, has not initiated action</td>
<td>Intends to quit smoking, but has not taken action to quit</td>
<td>Intends to set a household ban, but has not taken action to do so</td>
</tr>
<tr>
<td>5. Considers taking action, intends to act, has initiated action</td>
<td>Intends to quit smoking, has taken action to quit; has quit less than 24 h</td>
<td>Intends to set a household ban, has begun to set ban; ban in place less than 24 h</td>
</tr>
<tr>
<td>6. Implements precaution</td>
<td>Successfully quit for 24 h or more</td>
<td>Household smoking ban in place for 24 h or more</td>
</tr>
<tr>
<td>7. Maintains precaution over time</td>
<td>Successfully quit for 6 months or more</td>
<td>Household ban successfully in place for 6 months or more</td>
</tr>
</tbody>
</table>

Self-efficacy has been postulated to be the most influential cognitive mechanism mediating behavioral change (Bandura, 1986, 1995, 1997) and has been successfully applied to a variety of areas of health behavior change [e.g. (Clark et al., 1991; Borrelli and Mermelstein, 1998)]. We hypothesize that self-efficacy will be the primary mechanism through which change occurs in the BAM condition.

PAM is a theory that consists of seven stages (Table I) that describe how people process risks and communications related to risk (Weinstein, 1988; Weinstein et al., 1998). Thus, the primary mechanism of change espoused by the PAM model is risk perception. Risk perception is a meta-construct that is measured by three constructs: perceived vulnerability to the hazard, severity of the consequences if the precaution is not adopted and level of optimistic bias or the erroneous belief that personal risk is less than the risk faced by others (Table II). The PAM intervention focuses on augmenting risk perception and reducing optimistic bias through objective, physiological feedback regarding the effects of smoking on both the smoker and on their child with asthma. Figure 1 displays our theoretical model and hypothesized intervention effects.

The AHCPR guidelines will be the intervention
Parents of Asthmatics Quit Smoking

Table II. Identifying and measuring the mediators of change as determined by PAM and BAMa

<table>
<thead>
<tr>
<th>PAM mediators</th>
<th>Operational definition (as applied to smoking)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimistic bias</td>
<td>erroneous belief that personal risk is less than the risk faced by others</td>
</tr>
<tr>
<td>Perceived vulnerability</td>
<td>perceived personal risk</td>
</tr>
<tr>
<td>Perceived severity (to self)</td>
<td>severity of consequences of continued smoking</td>
</tr>
<tr>
<td>Perceived severity (to child)</td>
<td>severity of consequence of continued smoking</td>
</tr>
<tr>
<td>Perceived effectiveness (for self)</td>
<td>reduction of personal risk by quitting</td>
</tr>
<tr>
<td>Perceived effectiveness (for child)</td>
<td>reduction of child’s risk by quitting</td>
</tr>
<tr>
<td>Decisional balance</td>
<td>costs and benefits of continued smoking versus quitting</td>
</tr>
<tr>
<td>Motivation</td>
<td>readiness to change behavior</td>
</tr>
<tr>
<td>Passive smoking efficacy expectation</td>
<td>confidence in personal ability to reduce ETS</td>
</tr>
<tr>
<td>Passive smoking outcome expectation</td>
<td>belief that reducing tobacco smoke exposure to child will reduce asthma symptoms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BAM mediator</th>
<th>Operational definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy</td>
<td>confidence in personal ability to carry out the pre-caution</td>
</tr>
<tr>
<td>Subgoal setting</td>
<td>number of behavioral goals set and progress towards achievement</td>
</tr>
</tbody>
</table>

aAll variables are measured at baseline, end of treatment (8 weeks after baseline), and then 2, 6 and 12 months after the end of treatment.

through which BAM is operationalized, while Motivational Interviewing strategies coupled with physiological feedback will be the intervention through which PAM is operationalized. Motivational Interviewing is a therapeutic style that aims to enhance motivation to change behavior among those who are not motivated to change (Miller and Rollick, 1991; Rollnick et al., 1999). It is patient centered and directly tailored to patients’ readiness to change their behavior. For those at lower motivational levels, techniques such as cognitive dissonance (Festinger, 1957), decisional balance (Velicer, 1985) and helping the patient understand the role that smoking plays in his or her life are important. Increasingly more directive approaches, such as problem solving and skills building, are used for those who are ready to quit. Motivational Interviewing has been shown to be effective in a wide variety of areas of health behavior change (Resnicow et al., 2002), especially among individuals who are low in readiness to change (Heather et al., 1996; Butler et al., 1999).

We chose Motivational Interviewing as the intervention to operationalize PAM constructs because its client-centered focus is ideal for conveying risk messages in an empathic, non-judgmental manner. This is especially important in the PAM condition, since we are providing feedback to the parent on how their smoking is affecting their child’s asthma. The practitioner who is trained in a Motivational Interviewing style will be well equipped to handle the client resistance and guilt that may be engendered by this type of feedback.

We believe that a focus on risk perception and motivation, will outperform standard care approaches that involve building self-efficacy for several reasons:

1. Minority and low-income smokers are less likely to personalize health risks and focus on the benefits of quitting (Bastida, 1993; King et al., 1997).
2. Most smokers are aware of the dangers of second-hand smoke to their children with asthma and still continue to smoke, possibly a function of their erroneous belief that their personal risk is less than the risk faced by others (i.e. optimistic bias).
3. Since our smokers will be proactively recruited and are not necessarily motivated to quit, the focus on ‘action-oriented’ strategies (strategies for quitting) described by the AHCPR guidelines will be likely mismatched to their level of motivation.
Fig. 1. Hypothesized intervention effects.
Although these guidelines have been shown to be effective in helping motivated smokers quit, they are less helpful for the majority of smokers who are not motivated to quit. Thus, we believe that PAM is an ideal theory-based intervention for this population of smokers who possess various levels of motivation to quit.

**Intervention strategy**

Few attempts have been made to incorporate translational, theory-based health behavior change research into intervention programs delivered by home health care providers in the public health arena. Incorporating health behavior interventions into home health care offer several advantages:

1. It is an innovative channel of access to culturally and economically diverse populations, as low-income smokers are less likely to see a regular physician (King et al., 1997) or attend outpatient asthma education programs (Wilson and Starr-Schneidkraudt, 1994).
2. It can capitalize on the teachable moment engendered by the child’s asthma exacerbation.
3. It provides repeated and sometimes lengthy contacts with families who are particularly receptive to the empathic support and trust fostered by repeated contacts.
4. It provides smoking cessation to parents who may not otherwise spontaneously quit or seek treatment.

Intervention components common to both conditions are:

1. Provision of asthma treatment and the ‘Breathe Easy’ asthma education program.
2. Self-help smoking cessation treatment manuals (American Lung Association).
3. Free nicotine patch therapy, if they are ready to quit in the next 30 days.

Participants in both conditions receive a total of three visits, but if more than three visits are warranted by medical necessity, the nurses continue to track the number, frequency and content of all visits.

The BAM intervention is more ‘action oriented’ in that the nurse discusses strategies and options for helping the smoker quit, even if the smoker is not currently motivated to do so. The nurse focuses on increasing the smoker’s self-efficacy to quit through teaching problem-solving and coping skills, in case the smoker chooses to quit some day. As stated in the AHCPR guidelines, smokers are advised to quit by the nurse with a clear, strong and personalized message (‘As your nurse, I must tell you that quitting smoking is the best thing you can do for your health and the health of your children’). Smokers are also encouraged to use nicotine replacement therapy, provided with problem solving and advice to promote successful quitting, assisted with a quit plan, and supplied with supplementary self-help materials. Problem-solving therapy includes the following components: coping skills training, subgoal setting, recognition of danger situations, relapse prevention, and the provision of basic information about smoking and successful quitting (Fiore et al., 1994). It is hypothesized that several of the treatment components outlined above will enhance self-efficacy and that self-efficacy will be the primary mediator of behavior change. Specifically, self-efficacy will be enhanced by: (1) setting subgoals (e.g. cutting down, nicotine fading), (2) the acquisition, practice and mastery of non-smoking skills, (3) recognition of danger situations and strategies to combat high risk situations, (4) encouragement, and (5) reframing past quit attempts.

The PAM intervention will use expired air CO feedback and feedback on home ETS levels to increase smokers’ risk perceptions. Using a CO monitor, the nurse provides the participant with a personalized health risk message based on the smokers’ current health symptoms and CO level, and explains that the physiological damage and disease risk from smoking can be attenuated by quitting smoking. ETS assessment and feedback are used to increase the smokers’ awareness of risk of their smoking to those in their environment, and in particular, their child with asthma. For 1 week, one ETS monitor is placed in the room where the child spends the most time and one
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badge-like ETS monitor is worn by the child. After laboratory analyses of both ETS monitors, the nurse presents a personalized message regarding the child’s health to the family, such as ‘Based on the measurements of ETS in your home last week, your child breathed in as much smoke as if s(he) would have if s(he) had smoked X number of cigarettes last week’. ETS exposure is measured both pre- and post-intervention, to detect intervention effects and to provide extra motivation to families who have made changes. Passive nicotine monitors are also placed in the homes and on the children of BAM participants for comparison of changes in ETS levels with the PAM group. No feedback on ETS levels is provided to the BAM group until the study is completed.

During PAM treatment, the nurse also utilizes several motivational techniques to accelerate the smokers’ readiness to quit, including discussing the costs and benefits of smoking and quitting (decisional balance), focusing responsibility on the smoker for deciding to quit, empathizing with ambivalence, and highlighting cognitive dissonance by helping the patient to perceive the target behavior as seriously discrepant with his or her goals. We realize that a subset of these smokers may have no difficulty connecting their own or their child’s illness with their smoking behavior and may experience guilt for having contributed to the development of asthma in their children. The Motivational Interviewing protocol is not designed to induce guilt, but rather to highlight the discrepancy between one’s current position and one’s goals while providing hope and emphasizing short- and long-term benefits of quitting on their personal health, as well as on the health of their child.

The differences between BAM and PAM are displayed in Table III. There exist several important differences between the conditions:

1. While PAM emphasizes the importance of the communication and processing of risks, BAM emphasizes the self-regulatory components of social cognitive theory, such as skill building, subgoal setting and enhancement of self-efficacy.

2. BAM participants will not receive physiological feedback regarding how smoking may be harmful to themselves and their children.

3. PAM takes into account readiness to quit before action-oriented strategies are implemented, such that only subjects who are ready to quit will receive this part of the intervention.

Although both theories are within the same overarching social cognitive framework, several important differences exist between the conditions in terms of theoretical assumptions and mediators of change. BAM posits a linear relationship between mediators and outcome (e.g. higher levels of self-efficacy lead to greater behavior change). There is no clear guidance from the social cognitive constructs that comprise BAM about prediction of reciprocal non-linear relationships and interactions (Baranowski et al., 1997). PAM, however, is a series of distinct, qualitative stages that posit differential processing of risks at each stage (Weinstein, 1988). For example, there is a qualitative difference between the person who knows nothing about a hazard (in this case, the effect of smoking on children with asthma), and the individual who has thought about the issue and has concluded that there is no risk. The first person will be open-minded about the issue (Janis and Mann, 1976), and the second person will tend to produce a biased response and selectively attend to messages that support his or her own position. Thus, we hypothesize that the concrete evidence of risk that is demonstrated by the physiological feedback, combined with a client-centered Motivational Interviewing protocol, will facilitate behavior change.

Nurses are trained to deliver both PAM and BAM interventions over 2 days and additional subsequent ‘booster’ sessions. An educational curriculum for nurse-delivered smoking cessation counseling and a companion pocket guide for nurses will be adapted from a previous study that utilized home health care nurses to motivate homebound medically ill patients to quit smoking (B. Borrelli, PI; NCI RO1 CA 74553). Treatment fidelity for both conditions is maintained through several strategies: (1) pre- and post-training nurse
Parents of Asthmatics Quit Smoking

**Table III. Differences in intervention components between PAM and BAM**

<table>
<thead>
<tr>
<th>BAM</th>
<th>PAM</th>
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<tbody>
<tr>
<td>Focuses on enhancing self-efficacy through overcoming barriers to quitting, and developing problem-solving and coping skills (e.g. recognition of smoking triggers and danger situations, ways to reduce craving, etc.) regardless of the caregiver’s readiness to quit.</td>
<td>Focuses on enhancing perception of risk to one self and one’s child through motivational strategies and physiological feedback. Adopts a problem-solving approach when the smoker is ready to quit, and focuses on highlighting discrepancies and resolving ambivalence when the smoker is less ready to quit.</td>
</tr>
<tr>
<td>Smokers are advised to quit with a clear, strong, personalized message: ‘Quitting smoking is the best thing you can do for your health and the health of your children’. Discusses the various options for quitting, how to use nicotine replacement, and how to make a quit plan. Self-monitoring of cigarette consumption is encouraged as a first step. Self-efficacy is enhanced through setting small goals towards quitting, and reframing past quit attempts as learning experiences, not failures.</td>
<td>Motivational strategies such as weighing the costs and benefits of smoking and quitting, building a discrepancy, and exploring concerns about smoking behavior are used to help caregivers think more about their smoking and its effect on their child’s asthma. Options for quitting are explored if the patient is ready to use them. Feedback on levels of CO and ETS is provided, and is discussed in the context of the parent’s and child’s physiologic symptoms. Benefits of quitting to self and child are discussed in an Motivational Interviewing style.</td>
</tr>
</tbody>
</table>

We plan to measure intervention outcomes on multiple levels, including the smoking behavior of the parent, the degree of ETS in the home, and the child’s subsequent asthma morbidity and health care utilization (Table IV). An additional critical goal is to identify the mediators of behavior change within and across each intervention, providing information regarding the mechanisms of change in each condition (Table II). Figure 1 displays our model of intervention effects, including hypothesized mediators and moderators.

Our primary aim is compare BAM and PAM on differential treatment efficacy. After controlling for demographic covariates (e.g. education, asthma severity), we hypothesize that PAM will outperform BAM on the change in motivational readiness to quit, biochemically verified 7-day point prevalence abstinence in the primary caregiver, reduction of ETS and number of self-reported 24-h quit attempts. Fixed-effects generalized linear models will be used to analyze cross-sectional outcomes;

**Table IV. Intervention outcome variables and method of assessment**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Method of assessment</th>
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<tbody>
<tr>
<td>Parental smoking current smoking status</td>
<td>self-report and biochemical validation</td>
</tr>
<tr>
<td>7-day point prevalence motivation to quit</td>
<td>self-report contemplation ladder (Biener and Abrams, 1991) stage of change (Prochaska et al., 1985)</td>
</tr>
<tr>
<td>number of quit attempts</td>
<td>self-report</td>
</tr>
<tr>
<td>ETS amount of ETS exposure self-reported ETS exposure</td>
<td>passive nicotine monitoring structured interview (Matt et al., 1999)</td>
</tr>
<tr>
<td>Asthma morbidity asthma symptoms</td>
<td>functional morbidity (Rosier et al., 1994) parent report claims, data, pharmacy records</td>
</tr>
</tbody>
</table>

*Outcome variables are measured at the end of treatment (8 weeks after baseline), and 2, 6 and 12 months after the end of treatment.*
logistic regression for dichotomous outcomes, Poisson regression for counts and normal linear regression for continuous data. Random effects of extensions of these models will be used to handle the corresponding longitudinal outcomes.

We will use a series of hierarchical regression equations in order to identify mediators of change (Baron and Kenny, 1986). We hypothesize that the mediators of behavior change proffered by the PAM theory (e.g. risk perception) will be specifically sensitive to the PAM intervention in that they will change differentially in those receiving PAM versus those receiving BAM. BAM mediators (e.g. self-efficacy), on the other hand, will be specifically sensitive to the BAM intervention such that they will change differentially in those receiving BAM versus PAM.

We further hypothesize that PAM stages will be discriminated by different predictor variables and that individuals in advanced stages of the precaution adoption process will report greater levels of hypothesized mediators of stage movement than those in the earlier stages. Two sets of analyses will be conducted in order to discriminate among smokers in different stages (Blalock et al., 1996). First, in order to examine the relationship between stage and individual predictor variables, we will use MANOVA. Second, we will use stepwise discriminant analysis in order to determine which predictors have both independent and joint effects on stage classification. The predictors of interest are: perceived severity, perceived personal vulnerability, perceived vulnerability for the smoker’s child, optimistic bias, precaution effectiveness and decisional balance. Canonical discriminant analysis will be used to derive the linear combinations of the selected variables that best explained the between stage variation. Covariates will be determined in two separate stepwise discriminant analyses predicting PAM stage and interactions will be tested.

Another aim of the study is to measure the effect of smoking cessation and ETS reduction on the children with asthma. We hypothesize that the reductions in ETS and smoking in caregivers will, in turn, result in reduction of asthma symptoms, reduction of school days missed and other activity limitations, and decreased health care utilization (ER visits, physician visits, rehospitalizations) for children with asthma. Random-effects generalized linear regression models will be used to address this hypothesis using each of the above child-related variables as dependent variables, and smoking status and asthma severity as covariates.

**Conclusion**

This translational research project attempts to bridge the gap between theory-based research and public health contexts. We will not only be able to identify which treatment produces health behavior change, but also the processes by which behavior change occurs. Importantly, the intervention is proactively delivered to a hard-to-reach population who may or may not be motivated to quit smoking. Thus, these theoretical models will be tested in a real-world setting. We hope that the formation of partnerships between academic and non-academic organizations enhances the probability that our academically based research will reach the populations who need it most (i.e. minority, economically disadvantaged and possibly unmotivated to quit) and be maintained even after the research funding has ended.

The novel approach of incorporating smoking cessation into a medical visit for asthma education has the potential to improve not only one, but two health behavior outcomes—smoking cessation in the caregiver and asthma in the child. In identifying which smoking cessation treatments are most effective for parents of children with asthma, we take the first steps towards reducing two costly public health problems and towards improving the quality of life for families of children with asthma.

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