Journal of Consulting and Clinical Psychology
2008, Vol. 76, No. 5, 790–798


0022-006X/08/$12.00 DOI: 10.1037/a0013275

# Prospective Associations Between Coping and Health Among Youth With Asthma

Hannah M. C. Schreier and Edith Chen
University of British Columbia

The present study evaluated whether primary and secondary coping would predict longitudinal asthma-related clinical outcomes, such as peak expiratory flow rate (PEFR) and self-reported school absenteeism, rescue inhaler use, and asthma-related physician contacts, in youth with asthma. The 62 youth (68% males) had an average age of 12.6 ± 2.73 years and were primarily of European origin. Coping and asthma outcomes were obtained by youth self-report at baseline and over a 12-month follow-up period. Greater secondary coping at baseline was related to greater increases in PEFR and a greater likelihood of physician contact over the following year. Greater primary coping at baseline was related to greater likelihood of rescue inhaler use, school absenteeism, and physician contact over the following year. In contrast, asthma measures at baseline did not predict changes in coping over the following year. These patterns suggest that youth who engage in secondary coping accept and adapt to their asthma in ways that improve pulmonary function over time. Youth who engage in primary coping may be more likely to communicate asthma problems to others, and such communication perhaps leads to increases in behaviors meant to address these problems.

*Keywords:* coping, asthma, children, adolescents

Asthma is one of the most common chronic illnesses among children in the United States, and its overall prevalence has been rising in recent years. In 2004, lifetime prevalence rates of asthma in U.S. children and adolescents under the age of 18 was 12.2% (Bloom & Day, 2006). Asthma has important consequences for daily life functioning and health care costs. In the United States, asthma is the third-ranking cause of hospitalizations among youth 15 years of age and younger (Popovic, 2001) and is one of the leading causes of school absenteeism (Akinbami, 2006). The economic impact of asthma, in terms of the annual cost of asthma care for youth below the age of 18 years in the United States, has been estimated at $3.2 billion (Weiss, Sullivan, & Lyttle, 2000). Thus, a greater understanding of the predictors of asthma morbidity is crucial for the design of interventions to reduce the impact of asthma on our society.

## Psychological Influences on Asthma

Many factors are believed to influence asthma, and psychological factors (e.g., stress, anxiety, and depression) are often cited as an important contributor. These factors are associated with nonadherence to medication, greater exposure to asthma triggers, and other asthma-related outcomes (Lehrer, Feldman, Giardino, Song, & Schmaling, 2002). Coping is another psychological factor often hypothesized to be important for health; it is typically defined as cognitive and behavioral efforts aimed at dealing with external demands from the environment (i.e., stress; Lazarus & Folkman, 1984). Several studies have linked coping to health outcomes relating to a number of issues, including arthritis (Penninx, van Tilburg, Deeg, et al., 1997), mortality in older age (Penninx, van Tilburg, Kriegsman, et al., 1997), survival after myocardial infarction (Berkman, Leo-Summers, & Horwitz, 1992), and asthma-related hospitalizations in adults (Adams, Smith, & Ruffin, 2000). Although coping has been implicated as affecting health outcomes in a number of studies, its impact on asthma, particularly among youth, has not received much empirical study and hence forms the focus of the present study.

## Definitions of Coping

Various approaches to conceptualizing coping have been proposed in the literature. One common conceptualization of coping distinguishes between efforts to change the environment and efforts to adapt oneself to one's environment. The former approach, referred to herein as primary coping, encompasses active, approach-oriented behaviors. This approach has been labeled behavioral coping (Worchel, Copeland, & Barker, 1987), problem-focused coping (Lazarus & Folkman, 1984), and primary control coping (Rothbaum, Weisz, & Snyder, 1982). These types of coping are designed to eliminate and alter distressing events, and they include strategies such as seeking information and support and other direct efforts aimed at changing a situation (e.g., through generating possible solutions or expressing one's emotions).

Some stressors, however, cannot easily be counteracted directly, in which case people may adopt more indirect coping strategies. This type of coping, referred to herein as secondary coping, focuses on adjusting oneself to the environment. Names for these

Hannah M. C. Schreier and Edith Chen, Department of Psychology, University of British Columbia, Vancouver, British Columbia, Canada.

This research was supported by funding from the Canadian Institutes of Health Research and the William T. Grant Foundation.

Correspondence concerning this article should be addressed to Hannah M. C. Schreier, Department of Psychology, 2136 West Mall, University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada. E-mail: hannahs@psych.ubc.ca

strategies include cognitive coping (Worchel et al., 1987), emotion-focused coping (Lazarus & Folkman, 1984), and secondary coping (Rothbaum et al., 1982). Overall, secondary coping represents a more internally focused coping style that includes strategies such as cognitive restructuring and distraction.

In a recent review article, Morling and Evered (2006) argued that secondary coping can be conceptualized in two ways. One way relates to the extent to which individuals perceive control over a situation (control focused). According to this conceptualization, people engage in secondary coping with the aim to increase their perceived control over their environment. The other conceptualization relates to the fit between a person and his or her environment. In this case, people engage in secondary coping strategies with the intention to fit in better with their current environment. Morling and Evered concluded that when secondary coping is conceptualized in terms of a fit focus, this type of coping is adaptive and is related to positive outcomes. This is so because, under the fit-focused view, secondary coping involves both acceptance of the environment and adjustment to it. The implication is that the self must be congruent with the reality of the surrounding environment and that it is not sufficient to passively accept the environment in its current state. Unfortunately, most research to date has failed to differentiate between these two distinct types of secondary coping.

In the present study, we assessed the degree to which both primary and secondary coping strategies could predict asthma outcomes in youth. Primary strategies included efforts to alter the conditions of stressful situations such as problem solving, emotional regulation, and emotional expression. Secondary coping included a fit-focused conceptualization of efforts to accept and adjust to stressful situations (e.g., acceptance, positive thinking, cognitive restructuring, and distraction).

## Coping and Asthma

Only a few studies in previous research have investigated how coping relates to mental or physical health outcomes in children with chronic illnesses. Some of these studies have primarily provided descriptive information about the types of coping strategies used by children and adolescents with chronic illnesses (e.g., Band & Weisz, 1990; Hampel, Rudolph, Stachow, Lass-Lentzsch, & Petermann, 2005; Reid, Dubow, & Carey, 1995; Spirito, Stark, Gil, & Tyc, 1995).

Several studies have investigated the impact of coping on health outcomes in patients with asthma. A review of coping in patients of all ages with asthma (Barton, Clarke, Sulaiman, & Abramson, 2003) concluded that, overall, emotion-focused strategies (e.g., mostly secondary coping strategies) were related to poorer clinical outcomes, such as medication nonadherence and emergency department visits.

In children with asthma, findings have been mixed. In one study, active (or primary) coping was related to better management behaviors and greater participation in family, social, and physical activities (Mitchell & Murdock, 2002); however, avoidance (or secondary) coping was associated with the same set of positive behaviors. In contrast, across a sample of adolescents with a variety of chronic illnesses (asthma, cystic fibrosis, juvenile arthritis, and constitutional eczema) Meijer, Sinnema, Bijstra, Mellenbergh, and Wolters (2002) found that greater use of passive coping (e.g., depressive reactions and other forms of secondary coping) was linked to poorer psychosocial functioning (lower self-esteem, poorer social skills, more anxiety, and less assertive behavior), whereas greater use of active coping (e.g., confrontation and other types of primary coping) was associated with positive psychosocial functioning. Part of the reason for these mixed results, especially with respect to findings for secondary coping, may be the lack of differentiation between control-focused and fit-focused secondary coping styles.

One study (Nazarian, Smyth, & Sliwinski, 2006) investigated the impact of the use of avoidant (i.e., secondary) coping strategies on a more objective asthma outcome, peak expiratory flow rate (PEFR), in adults with asthma. PEFR represents the maximal speed at which a person can blow out air and is considered to be a measure of airway obstruction. Using ecological momentary assessment, Nazarian et al. administered a coping questionnaire five times a day for 1 week. Participants were asked to use an ambulatory peak flow meter each time. Nazarian et al. reported that denial, a form of avoidant coping, was associated with both more asthma symptoms and worse PEFR over the 1-week assessment period.

## Current Study

Research to date on coping and pediatric asthma has tended to focus on behavioral or psychosocial effects, rather than the physical health implications of different coping styles. Furthermore, previous studies used cross-sectional designs that left the directionality of associations between coping and health unclear. For example, an association between coping and asthma outcomes could be due to a specific type of coping causing difficulties with one's asthma or to problematic asthma changing one's coping style.

To deal with these shortcomings, we sought to advance research in this field by investigating two primary questions in a prospective longitudinal study of youth with asthma: (a) Do coping strategies predict changes in asthma outcomes over time, or, conversely, do asthma profiles predict changes in how youth cope with health problems over time? and (b) is it primary or secondary coping that is associated with self-reported or objective asthma outcomes? We note that preferred coping strategies may change as youth age or reach different developmental stages. Ideally, one would also like to examine whether coping and its relationship to asthma vary by age; however, given that this is one of the first longitudinal studies of both coping and asthma in a sample of youth, this study focuses on the question of directionality and leaves developmental issues for future research. We note that previous studies have found that distinct factors of primary and secondary coping exist in children ranging from 11 to 18 years of age (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000).

We hypothesized that primary coping styles would be related to a lower likelihood of school absences, rescue inhaler use, and physician contacts over the 12-month follow-up, as well as to higher PEFR. In addition, we hypothesized that fit-focused secondary coping would be related to a decreased likelihood of the above asthma outcomes and higher PEFR. This hypothesis is consistent with the theoretical predictions made by others about the two types of secondary coping (Morling & Evered, 2006).

## Method

### *Participants*

Participants were 42 boys and 20 girls with physician-diagnosed asthma who lived in the Vancouver, British Columbia, area. They had a mean age of 12.6 years (SD = 2.73 years) and were recruited through newspaper ads, physician offices, public schools, and community flyers between June 2004 and June 2006 as part of a larger, ongoing longitudinal study investigating pathways to health in children and adolescents. Data reported in this paper are based on the first group of participants, whom we were able to follow for an entire year. The recruitment time frame of this study was balanced across the year, and the overall retention rate of the study so far has been 85%. Dropout rates between the first two visits and the second and third visits were 9% and 5%, respectively. Those participants who discontinued the study after their first or second visit were not significantly different from those who remained in the study in terms of age, gender, ethnicity, asthma severity, use of beta agonists and inhaled corticosteroids; nor did they differ in terms of baseline values of PEFR, school absenteeism, rescue inhaler use, and physician contact (all $|t\text{s}| < 1.6$; all $p\text{s} > .10$). Inclusion criteria were (a) being between 9 and 18 years of age, (b) having no chronic illnesses other than asthma, and (c) being English speaking. Participants who had experienced an acute respiratory illness within the previous 4 weeks were rescheduled for a later date.

A wide range across asthma severity and demographic variables was represented in our sample. Participants had been diagnosed with asthma an average of 8 ± 4 years before and were classified as having mild intermittent asthma (16.1%), mild persistent asthma (37.1%), moderate persistent asthma (35.5%), or severe persistent asthma (11.3%). At study entry, 90.3% of our sample was on medication, either inhaled corticosteroids or beta agonists. Of those sampled, 62.9% were of European origin, 25.8% were of Asian origin (coded as Chinese, Indian, or other Asian descent), and 11.3% were of other ethnic origin (including African, Latin American, and First Nations/American Indian descent). Finally, 25.8% of mothers of youth in the study had completed a high school diploma or less, 38.7% had completed some college, and 35.5% had completed an undergraduate or graduate degree.

### *Measures*

*Responses to Stress Questionnaire (RSQ).* Primary and secondary coping were assessed with the Responses to Stress Questionnaire (Connor-Smith et al., 2000). Primary control strategies refer to efforts to alter the conditions of stressful situations and include problem solving (e.g., trying to fix the problem), emotional regulation (e.g., doing things to keep emotions under control so they do not worsen situations), and emotional expression (e.g., letting someone know how one is feeling). Secondary coping refers to efforts to accept and adjust to stressful situations as opposed to changing the situation itself. These strategies include acceptance (e.g., learning to live with things the way they are), positive thinking (e.g., telling oneself that everything will be okay), cognitive restructuring (e.g., thinking about the good that will come from the situation), and distraction (e.g., thinking about other things to keep one's mind off the problem).

Secondary coping questions included in the RSQ capture both the adjustment to and the acceptance of a situation, consistent with a person-by-environment-fit definition of secondary coping. Each subscale was assessed by three questions (rated on a 4-point Likert scale) that were summed to create a single score for each subscale; higher scores indicated more of each type of coping. Primary and secondary coping were found to be separate factors during testing and development of the RSQ (Connor-Smith et al., 2000). Overall scores for primary and secondary coping were obtained by summing the appropriate subscales to create one score for each type of coping. This resulted in a range of possible scores from 9 to 36 and from 12 to 48 for primary and secondary coping, respectively.

The stem of the RSQ is commonly tailored to prompt different scenarios in participants. Because our sample consisted of youth with asthma and we were interested in the strategies youth use to deal with problems related to their asthma, participants completed a version of the RSQ that addressed coping with health problems. All questions in this version were preceded by the prompt "Think back to a time when you had a problem with your asthma." The RSQ has been shown to have internal consistency of between $\alpha = .80$ and $\alpha = .84$ for the Primary and Secondary Coping subscales as well as test–retest reliabilities of $r = .81$ and $r = .74$ for these two subscales, respectively (Connor-Smith et al., 2000). Likewise, validity for the RSQ has been demonstrated through correlations with similar subscales on another self-report measure of coping, the COPE (Carver, Scheier, & Weintraub, 1989). In the present study, primary and secondary coping at baseline were positively correlated with each other ($r = .58$, $p < .001$). This correlation may represent the fact that more distressed individuals are more likely to engage in a greater number of coping strategies, as has been found in other studies (Connor-Smith et al., 2000). Internal consistency at baseline was $\alpha = .81$ for primary coping and $\alpha = .89$ for secondary coping.

*School absenteeism.* Youth with asthma were asked about the number of days of school they had missed due to asthma over the past 6 months at each of three time points (baseline, 6 months, 12 months). Because it was rare for participants to have more than one occurrence of school absenteeism, data from the two follow-up assessments were combined and coded as 0 (no days of school missed due to asthma between the baseline and final follow-up visits) or 1 (1 or more days of school missed due to asthma between the baseline and final follow-up visits). The final outcome variable represented the absence or presence of school absenteeism over the entire 1-year period following the baseline visit.

*Asthma-related physician contacts.* Youth with asthma were asked about the number of times a physician had been called or visited for asthma-related reasons over the past 6 months (this variable did not include regularly scheduled well visits or emergency department visits). This question was asked at baseline, 6 months, and 12 months. Because it was rare for participants to report more than one physician visit, data from the two follow-up assessments were combined and coded as 0 (no asthma-related physician visits between the baseline and the final follow-up visits) or 1 (one or more asthma-related physician visits between the baseline and the final follow-up visits). The final outcome variable represented the absence or presence of physician contacts over the entire 1-year period following the baseline visit.

*Rescue inhaler use.* At each visit, youth with asthma were asked about the number of days on which they used their rescue

inhaler over the past 2 weeks, excluding preventive use (e.g., before exercise). Because it was rare for participants to report using their rescue inhaler more than once, data were recoded as 0 (rescue inhaler not used within the 2-week periods preceding follow-up visits) or 1 (rescue inhaler used once or more within the 2-week periods preceding follow-up visits). The final outcome variable represented the absence or presence of rescue inhaler use during the 2-week period preceding each of the follow-up assessments.

In all cases, we considered the 1-year period after baseline to be the follow-up period. To increase the accuracy of reporting, we assessed outcomes twice over a 6-month recall period, rather than once over a 1-year period. We then combined the reports from the 6-month and 12-month assessments into one summary score that represented the occurrence of events during the 12-month follow-up period. These clinical outcomes have been previously related to asthma severity and have been used in other studies (e.g., Bacharier et al., 2003, 2007).

*PEFR.* At baseline and 12-month follow-up, participants were asked to complete three peak flow readings twice daily (at wake-up and before bedtime) for the 2 weeks following their visit using an AM1 PEF meter (Jaeger; Hoechberg, Germany). Each participant performed three peak flow readings in the lab, and the peak flow meter was then programmed on the basis of the participant's best value. PEFR percentages of best values for trials performed at home were calculated. Youth were considered adherent to their take-home peak flow assignment and their data were retained if they completed at least one reading on at least 10 of 14 days. Daily peak flow percentage values were averaged across the 14 days, resulting in an average home PEFR percentage score for each participant at baseline and again 1 year later.

### *Covariates*

A number of demographic and medical variables likely to be associated with our outcome measures were controlled for in our analyses. These variables included gender, age at study entry, ethnicity, medication use (inhaled corticosteroids and beta agonists taken in the 2 weeks prior to the first visit), and asthma severity. Asthma severity was classified as mild intermittent, mild persistent, moderate persistent, or severe persistent by Edith Chen, as determined from the National Asthma Education and Prevention Program/Expert Panel Report 2 Guidelines on the basis of the higher of symptom frequency and medication use, paralleling the approach of previous researchers (Bacharier et al., 2004).

### *Procedure*

Interested families contacted the laboratory and underwent a screening interview to determine their eligibility. If eligible, families were scheduled for an appointment and were mailed written consent forms for the parents and written assent forms for the children to review before the visit. Upon arrival at the laboratory, the families reviewed the study procedures and parents and children signed the written consent and assent forms, respectively. Youth then completed the RSQ on the computer. Younger participants were given the option of having the questions read to them by their research assistant. Youth were subsequently asked about their recent rescue inhaler use, school absenteeism, and unplanned asthma-related physician contacts as part of a semistructured asthma interview conducted by a trained research assistant. Approximately 6 months and 12 months later, families participated in a second and third visit during which youth completed the asthma interview again. As part of their third visit, youth also completed the RSQ.

At the end of their first and third visits, youth were provided with a peak flow meter and were given instructions on how to use it. Participants completed three peak flow readings in the lab to ensure that their method was correct and to obtain their personal best PEFR value. Peak flow readings were obtained twice per day for 2 weeks, and then peak flow meters were returned by mail. Participating families received a monetary compensation for their time. This study was approved by the research ethics board of the University of British Columbia.

### *Data Analysis*

Given the binary nature of our outcome variables, we used logistic regression analyses to test the relationship between primary and secondary coping at baseline and rescue inhaler use, school absenteeism, and asthma-related physician contact over the subsequent 12 months. Given the continuous nature of PEFR readings, the relationship between primary and secondary coping at baseline and PEFR at 12-month follow-up was assessed with multiple regression analyses. We also used multiple regression analyses to test whether school absenteeism, physician contact, rescue inhaler use, or PEFR at baseline predicted youth's coping at 12-month follow-up. All analyses were performed controlling for baseline values of the dependent variable, as well as youth's gender, age, ethnicity, asthma severity, and use of beta agonists and inhaled corticosteroids.

All tests were conducted with SPSS for Windows, Version 14.0. Two-tailed tests of significance were utilized for all analyses. Results were considered statistically significant at $p < .05$.

## Results

### *Summary Statistics*

Our participants reported average coping scores of 23.9 (on a scale from 9 to 36) and 30.8 (on a scale from 12 to 48) for primary and secondary coping, respectively. These values are close to coping scores found in other samples of patients coping with chronic illnesses as assessed by the same measure (e.g., among women dealing with breast cancer; Compas et al., 2006). For more information regarding our primary study variables, please refer to Table 1.

Use of the rescue inhaler was reported by 45.2% of our participants during the 2-week periods preceding their follow-up visits. In addition, 29% reported having missed school over the past year because of asthma and 35.5% reported contacting a physician because of their asthma over the past year.

Preliminary analyses indicated that a few of our covariates were correlated with our primary study variables. Age was related to school absenteeism ($r = -.25$, $p < .05$), physician contact ($r = -.23$, $p < .10$), and baseline PEFR ($r = .23$, $p < .10$); ethnicity was significantly related to school absenteeism, such that youth of European descent were more likely to miss school because of their

Table 1
*Information on Primary Study Variables at Baseline and 12-Month Follow-Up*

| Variable | Baseline | 12-month follow-up |
|---|---|---|
| Primary coping[a] | 23.9 ± 5.82 | 21.1 ± 6.0 |
| Secondary coping[a] | 30.8 ± 8.65 | 29.9 ± 7.9 |
| Asthma outcomes, % present[b] | | |
| Rescue inhaler use | 35.5 ($n$ = 22) | 45.2 ($n$ = 28) |
| School absenteeism | 25.8 ($n$ = 16) | 29.0 ($n$ = 18) |
| Physician contact | 27.4 ($n$ = 17) | 35.5 ($n$ = 22) |
| PEFR, percentile | 83.8 ± 9.1 | 86.8 ± 8.4 |

*Note.* PEFR = peak expiratory flow rate.
[a] Numbers presented here are the means and standard deviations for the summary scores of primary and secondary coping values. The range of possible scores was 9–36 points for primary coping and 12–48 points for secondary coping. [b] Values presented here represent the percentage of youth who had experienced particular asthma-related events in the 6 months preceding baseline and over the 12-month study period or, in the case of rescue inhaler use, over the 2 weeks preceding baseline and the two 2-week periods over the year following baseline.

asthma, $F(6, 55) = 2.29$, $p < .05$; and asthma severity was marginally related to rescue inhaler use ($r = .23$, $p < .10$). All other correlations were nonsignificant (all $p$s $> .10$).

### *Youth Coping Predicting Subsequent Rescue Inhaler Use*

See Tables 2 and 3 for further details on the analyses below. Primary coping at baseline was significantly and positively related to child-reported rescue inhaler use over the 2-week periods preceding the follow-up visits, even after we controlled for rescue inhaler use at baseline, asthma severity, use of beta agonists and inhaled corticosteroids, age, gender, and ethnicity ($B = 0.16$, $p < .05$). Youth with asthma who engaged in more primary control coping at baseline were more likely to have used their rescue inhaler at follow-up, independent of their rescue inhaler use prior to their first visit. Secondary coping was not related to rescue inhaler use ($B = 0.06$, $p > .10$).

### *Youth Coping Predicting Subsequent School Absenteeism*

Primary coping at baseline was significantly and positively related to child-reported school absenteeism over the follow-up period after we controlled for school absenteeism at baseline, asthma severity, use of beta agonists and inhaled corticosteroids, age, gender, and ethnicity ($B = 0.14$, $p < .05$). These findings indicate that youth with asthma who engaged in more primary coping at baseline were more likely to have missed school because of their asthma at follow-up, independent of school absences reported at study entry (for the previous 6 months). Secondary coping was not related to school absenteeism ($B = 0.04$, $p > .30$).

### *Youth Coping Predicting Subsequent Asthma-Related Physician Contact*

Both primary and secondary coping at baseline were positively related to child-reported asthma-related physician contacts over the follow-up period, after we controlled for baseline asthma-related physician contacts, asthma severity, use of beta agonists and inhaled corticosteroids, age, gender, and ethnicity (for primary coping, $B = 0.13$, $p < .05$; for secondary coping, $B = 0.08$, $p <$

Table 2
*Regression Analyses: Primary Coping Predicting the Presence of Clinical Asthma Outcomes Over a 12-Month Follow-Up Period*

| Outcome variable | $B$ | $SE$ | Odds ratio (95% CI) |
|---|---|---|---|
| | | Rescue inhaler use | |
| Block 1 | | | |
| Rescue inhaler use, baseline | 1.80** | 0.64 | 6.02 (1.71, 21.15) |
| Age | −0.01 | 0.13 | 0.99 (0.77, 1.27) |
| Ethnicity | −0.10 | 0.17 | 0.91 (0.65, 1.27) |
| Gender | −0.06 | 0.65 | 0.94 (0.26, 3.34) |
| ICS use | −0.02 | 0.08 | 0.98 (0.84, 1.14) |
| Beta agonist use | 0.08 | 0.07 | 1.09 (0.94, 1.25) |
| Asthma severity | 0.60 | 0.39 | 1.83 (0.85, 3.91) |
| Block 2 | | | |
| Primary coping | 0.16* | 0.06 | 1.17 (1.04, 1.32) |
| | | School absenteeism | |
| Block 1 | | | |
| School absenteeism, baseline | 1.22 | 0.74 | 3.39 (0.8, 14.29) |
| Age | −0.19 | 0.14 | 0.83 (0.63, 1.08) |
| Ethnicity | 0.37* | 0.18 | 1.45 (1.02, 2.06) |
| Gender | 0.48 | 0.68 | 1.61 (0.42, 6.11) |
| ICS use | 0.09 | 0.08 | 1.10 (0.94, 1.28) |
| Beta agonist use | −0.07 | 0.08 | 0.93 (0.81, 1.08) |
| Asthma severity | −0.50 | 0.43 | 0.61 (0.26, 1.42) |
| Block 2 | | | |
| Primary coping | 0.14* | 0.07 | 1.15 (1.01, 1.31) |
| | | Physician contact | |
| Block 1 | | | |
| Physician contact, baseline | 1.03 | 0.64 | 2.81 (0.81, 9.77) |
| Age | −0.15 | 0.12 | 0.86 (0.68, 1.09) |
| Ethnicity | −0.14 | 0.18 | 0.87 (0.62, 1.23) |
| Gender | −0.20 | 0.63 | 0.98 (0.28, 3.38) |
| ICS use | 0.06 | 0.07 | 1.06 (0.92, 1.22) |
| Beta agonist use | −0.03 | 0.07 | 0.97 (0.85, 1.11) |
| Asthma severity | 0.10 | 0.37 | 1.11 (0.53, 2.23) |
| Block 2 | | | |
| Primary coping | 0.13* | 0.06 | 1.14 (1.02, 1.28) |
| | | PEFR | |
| Block 1 | | | |
| PEFR, baseline | 0.19 | 0.14 | |
| Age | 0.37* | 0.54 | |
| Ethnicity | 0.22 | 0.74 | |
| Gender | −0.04 | 2.75 | |
| ICS use | 0.50 | 0.33 | |
| Beta agonist use | −0.61* | 0.32 | |
| Asthma severity | −0.19 | 1.62 | |
| Block 2 | | | |
| Primary coping | 0.21 | 0.22 | |

*Note.* With the exception of the analyses predicting peak expiratory flow rate (PEFR), which were performed with multiple regression analyses, all analyses were performed with logistic regression analyses. $B$s represent unstandardized values in the case of logistic regressions and standardized values in the case of multiple regressions. CI = confidence interval; Block 1 = covariates; ICS = inhaled coricosteroids; Block 2 = predictor variables; rescue inhaler use = the number of times of unplanned use due to asthma exacerbations; beta agonist use = planned, preventive use of beta agonists (e.g., before exercise).
* $p \leq .05$. ** $p \leq .01$.

Table 3
*Regression Analyses: Secondary Coping Predicting the Presence of Clinical Asthma Outcomes Over a 12-Month Follow-Up Period*

| Outcome variable | *B* | *SE* | Odds ratio (95% CI) |
|---|---|---|---|
| | | Rescue inhaler use | |
| Block 1 | | | |
| Rescue inhaler use, baseline | 1.80** | 0.64 | 6.02 (1.71, 21.15) |
| Age | −0.01 | 0.13 | 0.99 (0.77, 1.27) |
| Ethnicity | −0.10 | 0.17 | 0.91 (0.65, 1.27) |
| Gender | −0.06 | 0.65 | 0.94 (0.26, 3.34) |
| ICS use | −0.02 | 0.08 | 0.98 (0.84, 1.14) |
| Beta agonist use | 0.08 | 0.07 | 1.09 (0.94, 1.25) |
| Asthma severity | 0.60 | 0.39 | 1.83 (0.85, 3.91) |
| Block 2 | | | |
| Secondary coping | 0.06 | 0.04 | 1.06 (0.99, 1.14) |
| | | School absenteeism | |
| Block 1 | | | |
| School absenteeism, baseline | 1.2 | 2.74 | 3.39 (0.80, 14.29) |
| Age | −0.19 | 0.14 | 0.83 (0.63, 1.08) |
| Ethnicity | 0.37* | 0.18 | 1.45 (1.02, 2.06) |
| Gender | 0.48 | 0.68 | 1.61 (0.42, 6.11) |
| ICS use | 0.09 | 0.08 | 1.10 (0.94, 1.28) |
| Beta agonist use | −0.07 | 0.08 | 0.93 (0.81, 1.08) |
| Asthma severity | −0.50 | 0.43 | 0.61 (0.26, 1.42) |
| Block 2 | | | |
| Secondary coping | 0.04 | 0.04 | 1.04 (0.96, 1.12) |
| | | Physician contact | |
| Block 1 | | | |
| Physician contact, baseline | 1.03 | 0.64 | 2.81 (0.81, 9.77) |
| Age | −0.15 | 0.12 | 0.86 (0.68, 1.09) |
| Ethnicity | −0.14 | 0.18 | 0.87 (0.62, 1.23) |
| Gender | 0.02 | 0.63 | 0.98 (0.28, 3.38) |
| ICS use | 0.06 | 0.07 | 1.06 (0.92, 1.22) |
| Beta agonist use | −0.03 | 0.07 | 0.97 (0.85, 1.11) |
| Asthma severity | 0.10 | 0.37 | 1.11 (0.53, 2.30) |
| Block 2 | | | |
| Secondary coping | 0.08* | 0.04 | 1.09 (1.01, 1.17) |
| | | PEFR | |
| Block 1 | | | |
| PEFR, baseline | 0.19 | 0.14 | |
| Age | 0.37* | 0.54 | |
| Ethnicity | 0.22 | 0.74 | |
| Gender | −0.04 | 2.75 | |
| ICS use | 0.50 | 0.33 | |
| Beta agonist use | −0.61* | 0.32 | |
| Asthma severity | −0.19 | 1.62 | |
| Block 2 | | | |
| Secondary coping | 0.33* | 0.14 | |

*Note.* With the exception of the analyses predicting peak expiratory flow rate (PEFR), which were performed with multiple regression analyses, all analyses were performed with logistic regression analyses. *B*s represent unstandardized values in the case of logistic regressions and standardized values in the case of multiple regressions. CI = confidence interval; Block 1 = covariates; ICS = inhaled coricosteroids; Block 2 = predictor variables; rescue inhaler use = number of unplanned uses due to asthma exacerbations; beta agonist use = planned, preventive use of beta agonists (e.g., before exercise).
* $p \leq .05$. ** $p \leq .01$.

.05). Children and adolescents who engaged in more secondary and primary coping strategies were more likely to report unplanned contact with their physician because of their asthma at follow-up, independent of the number of physician contacts reported at baseline (for the previous 6 months).

Although multiple instances of the above clinical outcomes were not frequent, we tested whether the above patterns were similar if we used frequency scores with log transformations (to reduce kurtosis). The above results remained similar when assessed with multiple regression analyses on log-transformed scores. This result suggests that primary and secondary coping predict not only the likelihood of a clinical outcome occurring but the frequency of its occurrence. However, given that very few youth reported more than one instance of an outcome (e.g., only 9 of 62 youth reported more than one unplanned asthma-related physician contact), we retained the dichotomous variables as our primary outcomes.

### *Youth Coping Predicting Subsequent PEFR*

The vast majority of participants were adherent in that they collected and returned peak flow data (98.3% at baseline and 87.1% at 12-month follow-up). However, because we had electronic peak flow meters, we were able to assess whether they actually collected data at the specified times. Not surprisingly, a number of youth returned data that were incomplete. Following an approach used in previous studies (e.g., Chen, Chim, Strunk, & Miller, 2007), we excluded from analyses participants who did not complete peak flow measures on at least 10 or more of their scheduled 14 days. Doing so meant that our data would be higher in quality and more reliable and valid (i.e., there would be multiple days of recordings on which to base peak flow readings).

According to this criterion, 85.5% of our participants were adherent with their take-home peak flow assignment after their first visit and 69.4% were adherent following their last visit 1 year later. Thirty-nine youth (62.9%) were adherent with their take-home peak flow assignment at both their first and last visit, and their data were included in longitudinal analyses. Adherent youth were not different from nonadherent youth with respect to gender, ethnicity, primary and secondary coping at baseline, asthma severity, or beta agonists taken in the 2-week period prior to their first visit (all $p$s $> .20$). They were, however, marginally younger than nonadherent youth, $t(60) = 1.76$, $p < .10$, and had taken significantly more inhaled corticosteroids in the 2 weeks preceding their first visit, $t(60) = -2.14$, $p < .05$. However, controlling for age and use of corticosteroids did not alter our study results. Nonetheless, the possibility cannot be excluded that this subsample of participants was biased in some way, and the results should accordingly be viewed with caution. See Tables 2 and 3 for further details on the analyses below.

Secondary coping at baseline was positively related to PEFR during the 2-week home assessment 1 year later after we controlled for age, gender, ethnicity, asthma severity, use of beta agonists and inhaled corticosteroids, and PEFR at baseline (standardized $\beta = .33$, $p < .05$). Children and adolescents who engaged in more secondary coping strategies had higher PEFR percentiles at 12-month follow-up, independent of PEFR assessed at baseline. Primary coping was not related to PEFR 1 year later ($\beta = .21$, $p > .10$).

Finally, we conducted analyses entering both primary and secondary coping in the same block simultaneously. In this case, however, neither primary nor secondary coping predicted our outcome variables.

### *Baseline Asthma Measures Predicting Subsequent Child Coping*

In contrast to the above associations, PEFR at baseline and school absenteeism, physician contact, and rescue inhaler use at baseline did not predict child coping at 12-month follow-up (all *p*s $> .10$).

## Discussion

The present study found that baseline coping strategies reported by youth with asthma prospectively predicted clinical outcomes over the following 12-month period, whereas asthma measures at baseline did not predict changes in coping over the following 12 months. More specifically, secondary coping was associated with greater increases in PEFR as well as greater likelihood of physician contact over the following year. Primary control coping at baseline was associated with a greater likelihood of school absences, rescue inhaler use, and physician contact because of asthma. Our longitudinal study design allowed us to assess directionality in a way that previous cross-sectional studies could not. Hence, we were able to determine that psychological factors, such as coping, predicted future asthma profiles, whereas current health status with respect to asthma did not predict changes in coping over time. Below, we discuss these coping patterns in greater detail.

Greater secondary coping predicted higher PEFR at 12-month follow-up and a greater likelihood of unplanned physician contact over the course of a year. Given the improvement in an objective measure of asthma, PEFR, subsequent to the assessment of coping, one interpretation of these patterns is that secondary coping is beneficial to youth's pulmonary function.

The fit-focused conceptualization of secondary coping (Morling & Evered, 2006) suggests that people who engage in this type of coping aim to accept the reality of their situation and at the same time aim to adapt to it by cognitively and emotionally reframing events (e.g., by telling themselves that things will work out and focusing on the benefits possibly to be gained from the situation). Secondary coping may lead to a number of outcomes in youth with asthma. For example, it may reduce distress associated with asthma symptoms, which may otherwise serve to exacerbate current breathing problems. Youth with asthma who engage in secondary coping may thus be better at working through asthma exacerbations by remaining calm and not catastrophizing their symptoms. This aptitude in turn may result in long-term improvements in PEFR.

Another implication of this coping approach is that youth who engage in secondary coping may be better at recognizing times when they are not able to deal with a situation themselves and need to involve someone else in the process. This possibility could explain the increased likelihood of physician contacts among youth who engage in more secondary coping and could also explain the specificity of this association (i.e., physician contact may represent a form of accepting that one needs someone else to take control of a situation, whereas other clinical outcomes, such as rescue inhaler use, may be less relevant to this dimension of secondary coping). Hence, in light of the fit-focused conceptualization of secondary coping put forward by Morling and Evered (2006), we speculate that youth who are more accepting of and bettter adjusted to their asthma may be more willing to acknowledge times when they need help from others with respect to their asthma.

We note here that our interpretation of physician contacts is different from what has traditionally been proposed in the literature (Adams et al., 2000), namely, that a higher frequency of physician visits is indicative of greater asthma morbidity and worse asthma management. We suggest that greater physician contact, if combined with improvements in PEFR, may indicate youth who appropriately recognize times when they are in need of additional help and who hence engage in more adaptive asthma-management behaviors. However, we acknowledge that this explanation is speculative. It may be that the finding with physician contacts indicates a worsening of asthma over time and that peak flow measures were not able to detect this trend, given the short time frame of assessment.

Primary coping at baseline predicted a greater likelihood of missing days of school as a result of asthma, greater likelihood of using a rescue inhaler, and more frequent unplanned physician contact because of asthma over the following 1-year period. This result was somewhat surprising, in that previous research has shown that primary coping is linked to better asthma management behaviors and positive psychosocial functioning (e.g., Meijer et al., 2002). One explanation for these results may have to do with our focus in this study on childhood asthma. Youth who engage in more primary coping may be more likely to openly communicate their symptoms and distress by informing other people in their environment (e.g., parents and teachers) about their asthma and seeking help. In turn, these adults may feel more compelled to take action to help these children, perhaps by instructing them to use a rescue inhaler, encouraging them to stay home from school to rest, or contacting a physician to inquire about how to proceed. That is, when children are more communicative about their asthma symptoms and distress, they may prompt more action that manifests as clinical outcomes, such as inhaler use, school absences, and physician contacts. Hence, the greater frequency of these clinical outcomes may be related to the nature of the interactions that children who engage in primary coping have with the adults who take care of them.

Our findings with respect to PEFR differ from those of Nazarian et al. (2006), who reported that greater use of secondary coping predicted lower, not higher, PEFR when ecological momentary assessments were used over a period of 1 week. However, in that study, secondary coping was operationalized as denial coping, which is distinct from the forms of secondary coping assessed in the current study. We evaluated four domains of secondary coping (cognitive restructuring, acceptance, distraction, and positive thinking), all of which represent ways of engaging with a problem in a secondary fashion. In contrast, denial represents a method for disengaging from a problem (Connor-Smith et al., 2000). Taken together, these patterns suggest that not all styles of secondary coping have the same relationship with pulmonary function.

These findings suggest that clinicians who encourage a fit-focused approach to coping (i.e., who help youth to accept their asthma and to think in more positive ways about getting through the difficult times with their health) may improve youth's pulmonary function over time. Clinicians should also be aware that encouraging youth to communicate more openly about their

asthma and to get help from others (primary coping) could initially result in increases in health care contacts or school absences.

A second interesting finding is that primary and secondary coping were positively associated. This association suggests that some children may engage in high levels of both primary and secondary coping when dealing with their asthma.

As our sample size was not large enough to allow us to investigate whether there are clusters of individuals who engage in high primary and secondary coping or who engage in neither type of coping, we have not speculated about the clinical implications of this possibility (given that we did not formally test it). However, future studies with larger sample sizes should investigate whether people cluster into groups of low and high levels of multiple coping strategies and whether these types of patterns then relate to clinical outcomes of asthma among youth. Such studies may yield additional important information for future interventions and treatment that will help clinicians better predict changes in youth's asthma over time.

There are a number of strengths to this study. We used a longitudinal design, which allowed us to draw conclusions about whether coping can predict future health in youth. This design is particularly valuable, as most research to date has used cross-sectional designs that make it difficult to draw conclusions about directionality. Our study showed that the relationship between coping and clinical health outcomes is not bidirectional; although coping predicted PEFR and clinical outcomes over 1 year, the opposite was not true. This finding lends further support to evidence suggesting that coping in youth with asthma has significant implications for subsequent health.

There also are a number of limitations to the study. First, the study relied on self-report measures. However, Zhang et al. (2005) evaluated children's and parents' reports of asthma symptoms and found that, among 11- to 19-year-olds (73% of our sample fell into this age range), parent and child reports were equally accurate. They did find that parent reports were somewhat more accurate among 6- to 10-year-old children, but our sample included only children at the upper end of this age range (9–10 years). In addition, though we asked youth about the number of times they had experienced a certain outcome, our primary dependent variable was recoded to represent the absence or presence of any given event. We would expect that although the younger children in our sample might not have been able to remember the number of times an event had occurred, they would have more reliably remembered whether an event such as an unplanned physician visit had occurred. Parents may not always have had full information about their child's asthma-relevant behaviors; for example, they might not have been aware of times when youth used a rescue inhaler at school or at another other parent's house (if the parents were separated). The possibility of results being due to shared method variance would decrease if health care data from hospital or health care records were obtained in future research.

Second, different results might be obtained with a longer follow-up period or a more severe health-related stressor. For example, it is possible that health status may have effects on coping after periods longer than 1 year (the time frame of the current study) or with a more severe health event than asthma.

Third, a substantial portion of our participants had difficulties adhering to their take-home peak flow assignment. Although 87% of participants collected and returned peak flow data at both baseline and 12-month follow-up, we decided to include only data from participants who collected peak flow data on the majority (over two thirds) of the days, so as to have higher quality data that were more reliable and valid. We tested whether those participants who were adherent to peak flow collection were different from those who were nonadherent on any study variables. Groups did not differ on gender, ethnicity, primary and secondary coping at baseline, asthma severity, and beta agonist use (all $ps > .10$). They were, however, marginally younger than nonadherent youth, $t(60) = 1.76$, $p < .10$, and had taken significantly more inhaled corticosteroids in the 2 weeks preceding their first visit, $t(60) = -2.14$, $p < .05$. However, controlling for age and use of corticosteroids did not alter study results. Nonetheless, the possibility cannot be excluded that this subsample of participants was biased in some way, and the results should accordingly be viewed with caution.

Fourth, as peak flow was assessed during only 4 weeks of the year, it is possible that we missed asthma exacerbations. Hence, the picture of our participants' lung functioning painted by ambulatory peak flow meters may not be entirely accurate.

Fifth, our coping questionnaires reflected how youth reported they would respond to hypothetical scenarios. In future studies, researchers should use other methodologies to assess real-life situations and the coping strategies they elicit. Studies should also assess other dimensions of coping that are not contained in the RSQ but that may be important to asthma. For example, planning is one primary coping strategy that is not assessed in the RSQ. Planning refers to the generation of strategies for how to deal with a certain problem. This approach may be particularly important to those with a chronic illness, such as asthma, because youth who engage in planning may have a more detailed approach to monitoring and responding to signs of asthma exacerbations.

Finally, our participants represented a wide age range. Age was controlled for in all analyses and did not change the results, but it is possible that the relationship between coping and clinical asthma outcomes is different for youth at different stages of the age range represented here. Future research with larger samples should focus on specific age groups (e.g., preadolescents and adolescents) to ascertain whether these results hold within different age groups.

In sum, our study demonstrated that, in youth with asthma, coping predicts subsequent health over a 1-year period but that health status does not predict subsequent changes in coping. In this study, secondary coping was related to higher PEFR combined with an increased likelihood of physician contact at 12-month follow-up. Primary coping was related to an increased likelihood of school absenteeism, rescue inhaler use, and unplanned physician contact over 1 year. These patterns suggest that youth who engage in secondary coping accept and adapt well to asthma and that this coping style leads to improvements in pulmonary function over time. Youth who engage in primary coping may be more likely to communicate asthma problems to others; this coping style perhaps leads to behaviors meant to address these problems. Future research should investigate the nature of these different pathways in more detail. Overall, understanding the ways in which youth cope with problems appears to have important implications for the subsequent health of youth with asthma.

## References


Adams, R. J., Smith, B. J., & Ruffin, R. E. (2000). Factors associated with hospital admissions and repeat emergency department visits for adults with asthma. *Thorax, 55*(7), 566–573.

Akinbami, L. (2006). The state of childhood asthma, United States, 1980–2005. *Advance Data, 381,* 1–24.

Bacharier, L. B., Dawson, C., Bloomberg, G. R., Bender, B., Wilson, L., Strunk, R. C., et al. (2003). Hospitalization for asthma: Atopic, pulmonary function, and psychological correlates among participants in the Childhood Asthma Management Program. *Pediatrics, 112*(2), e85–e92.

Bacharier, L. B., Phillips, B. R., Bloomberg, G. R., Zeiger, R. S., Paul, I. M., Krawiec, M., et al. (2007). Severe intermittent wheezing in preschool children: A distinct phenotype. *Journal of Allergy & Clinical Immunology, 119*(3), 604–610.

Bacharier, L. B., Strunk, R. C., Mauger, D., White, D., Lemanske, R. F., Jr., & Sorkness, C. A. (2004). Classifying asthma severity in children: Mismatch between symptoms, medication use, and lung function. *American Journal of Respiratory & Critical Care Medicine, 170*(4), 426–432.

Band, E. B., & Weisz, J. R. (1990). Developmental differences in primary and secondary control coping and adjustment to juvenile diabetes. *Journal of Clinical Child Psychology, 19*(2), 150–158.

Barton, C., Clarke, D., Sulaiman, N., & Abramson, M. (2003). Coping as a mediator of psychosocial impediments to optimal management and control of asthma. *Respiratory Medicine, 97*(7), 747–761.

Berkman, L. F., Leo-Summers, L., & Horwitz, R. I. (1992). Emotional support and survival after myocardial infarction. A prospective, population-based study of the elderly. *Annals of Internal Medicine, 117*(12), 1003–1009.

Bloom, B., & Day, H. D. (2006). Summary health statistics for U.S. children: National health interview survey, 2004. *Vital Health Statistics, 10*(227), 1–85.

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology, 56,* 267–283.

Chen, E., Chim, L. S., Strunk, R. C., & Miller, G. E. (2007). The role of the social environment in children and adolescents with asthma. *American Journal of Respiratory & Critical Care Medicine, 176*(7), 644–649.

Compas, B. E., Beckjord, E., Agocha, B., Sherman, M. L., Langrock, A., Grossman, C. I., et al. (2006). Measurement of coping and stress responses in women with breast cancer. *Psycho-Oncology, 15*(12), 1038–1054.

Connor-Smith, J. K., Compas, B. E., Wadsworth, M. E., Thomsen, A. H., & Saltzman, H. (2000). Responses to stress in adolescence: Measurement of coping and involuntary stress responses. *Journal of Consulting and Clinical Psychology, 68,* 976–992.

Hampel, P., Rudolph, H., Stachow, R., Lass-Lentzsch, A., & Petermann, F. (2005). Coping among children and adolescents with chronic illness. *Anxiety, Stress & Coping: An International Journal, 18*(2), 145–155.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer.

Lehrer, P., Feldman, J., Giardino, N., Song, H.-S., & Schmaling, K. (2002). Psychological aspects of asthma. *Journal of Consulting and Clinical Psychology, 70,* 691–711.

Meijer, S. A., Sinnema, G. O., Bijstra, J., Mellenbergh, G. J., & Wolters, W. H. G. (2002). Coping styles and locus of control as predictors for psychological adjustment of adolescents with a chronic illness. *Social Science & Medicine, 54*(9), 1453–1461.

Mitchell, D. K., & Murdock, K. K. (2002). Self-competence and coping in urban children with asthma. *Children's Health Care, 31*(4), 273–293.

Morling, B., & Evered, S. (2006). Secondary control reviewed and defined. *Psychological Bulletin, 132,* 269–296.

Nazarian, D., Smyth, J. M., & Sliwinski, M. J. (2006). A naturalistic study of ambulatory asthma severity and reported avoidant coping styles. *Chronic Illness, 2*(1), 51–58.

Penninx, B. W., van Tilburg, T., Deeg, D. J., Kriegsman, D. M., Boeke, A. J., & van Eijk, J. T. (1997). Direct and buffer effects of social support and personal coping resources in individuals with arthritis. *Social Science & Medicine, 44*(3), 393–402.

Penninx, B. W., van Tilburg, T., Kriegsman, D. M., Deeg, D. J., Boeke, A. J., & van Eijk, J. T. (1997). Effects of social support and personal coping resources on mortality in older age: The Longitudinal Aging Study Amsterdam. *American Journal of Epidemiology, 146*(6), 510–519.

Popovic, J. R. (2001). 1999 National Hospital Discharge Survey: Annual summary with detailed diagnosis and procedure data. *Vital & Health Statistics—Series 13: Data From the National Health Survey, 151*, i–v.

Reid, G. J., Dubow, E. F., & Carey, T. C. (1995). Developmental and situational differences in coping among children and adolescents with diabetes. *Journal of Applied Developmental Psychology, 16*(4), 529–554.

Rothbaum, F., Weisz, J. R., & Snyder, S. S. (1982). Changing the world and changing the self: A two-process model of perceived control. *Journal of Personality and Social Psychology, 42,* 5–37.

Spirito, A., Stark, L. J., Gil, K. M., & Tyc, V. L. (1995). Coping with everyday and disease-related stressors by chronically ill children and adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry, 34*(3), 283–290.

Weiss, K. B., Sullivan, S. D., & Lyttle, C. S. (2000). Trends in the cost of illness for asthma in the United States, 1985–1994. *Journal of Allergy & Clinical Immunology, 106*(3), 493–499.

Worchel, F. F., Copeland, D. R., & Barker, D. G. (1987). Control-related coping strategies in pediatric oncology patients. *Journal of Pediatric Psychology, 12*(1), 25–38.

Zhang, L., Avila, L., Leyraud, L., Grassi, S., Raquel, T., Bonfanti, T., et al. (2005). Accuracy of parental and child's report of changes in symptoms of childhood asthma. *Indian Pediatrics, 42*(12), 1220–1225.


Received December 12, 2007
Revision received July 7, 2008
Accepted July 7, 2008 ■