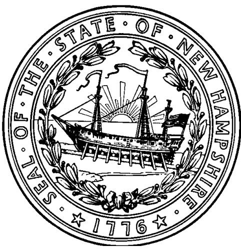


Asthma in New Hampshire

Pediatric Asthma Management and Control

I. Background

Asthma is a chronic lung disease that involves swelling and inflammation of the airways, reversible airway obstruction, and muscle spasms around the airways in response to a variety of triggers.

Inadequately controlled asthma has a significant impact on quality of life, school and work attendance and productivity of both children and their caregivers.[1]

- Asthma is the most common chronic illness among children, with nine million children in the United States less than 18 years old diagnosed with asthma.[2]
- Asthma is the leading cause of school absenteeism in the United States, accounting for an estimated 14.7 million missed school days annually.[3]
- Asthma is the third leading cause in the United States of hospitalization among children less than 15 years old.[3]
- The annual cost of treating asthma in the United States is $14.7 billion, and indirect costs (e.g., related to lost productivity) add another $5 billion.[4]

The episodic nature of the disease and the possibility of exposure to the many environmental and physiological triggers that exacerbate asthma underscore the importance of both self-monitoring of symptoms and dependable written action plans to serve as a guide for self-management. Lack of access to expert diagnosis and clinical management, as well as poor self-management, adversely affect whether an individual's asthma is under control and their quality of life.

Summary of Findings

- Almost 70% of children with asthma in New Hampshire may not have their asthma under control; children with asthma in general experience a lower quality of life than those without asthma.
- Only 31.4% (95% CI: 19.4-43.4) of children with current asthma in New Hampshire receive what could be characterized as a minimum standard of asthma education.
- Less than 50% of children with asthma in New Hampshire have ever received an asthma action plan or a flu shot in the past year.
- Approximately 50% of children with asthma in New Hampshire have been told by a health care provider to modify their home, school, or work environment.
- Approximately one third of children with asthma in New Hampshire live in a smoking household.
- Children with asthma are almost twice as likely to miss four or more days of school as those without asthma.

II. Pediatric Asthma in New Hampshire

This report provides results from the 2006-2007 New Hampshire Behavioral Risk Factor Surveillance System (NH BRFSS), the 2006-2007 NH BRFSS Child Asthma Call-back survey, and the 2003 National Survey of Children's Health (NSCH).

Since the data presented in this report are based on surveys that are weighted to represent the population of New Hampshire, all figures are presented with 95% confidence intervals (CI). The 95% CI represents the range of values that, with 95% certainty, includes the true value for the entire population. For example, in Figure 1 below, we are 95% sure that the prevalence of lifetime asthma is at least 10.9% and could be as high as 13.6%. When making comparisions between two groups (i.e., those with and without asthma), the 95% CI can be used to determine if there is a statistically significant difference between the two groups. The reader should also note that when the survey sample size is small, confidence intervals tend to be wider.

A. Prevalence of Lifetime and Current Asthma

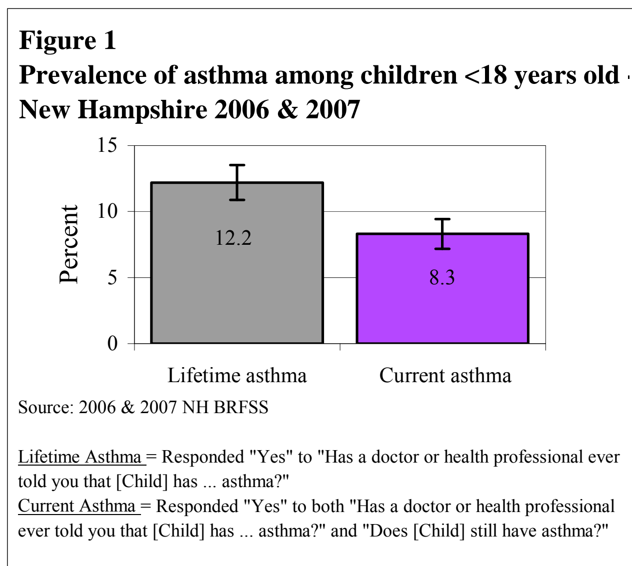


Figure 1
Prevalence of asthma among children <18 years old New Hampshire 2006 & 2007

Source: 2006 & 2007 NH BRFSS

Lifetime Asthma = Responded "Yes" to "Has a doctor or health professional ever told you that [Child] has ... asthma?"
Current Asthma = Responded "Yes" to both "Has a doctor or health professional ever told you that [Child] has ... asthma?" and "Does [Child] still have asthma?"

Prevalence by age, gender, household income, and insurance provider was examined for New Hampshire, but due to small numbers, no statistically significant difference was observed among these groups or over time (2005 to 2007). However, studies have shown that asthma prevalence rates tend to be higher in boys than girls among children 0-14 years old, but that girls tend to have a higher prevalence among children 15-17 years old. Other reports also indicate that rates are higher among children who are on Medicaid and those who live in households that earn less than $15,000 per year.[5, 6]

The remainder of this report includes results only for children with *current asthma*.

B. Asthma Management, Control and Quality of Life

Asthma Management:
Asthma management indicators from the NH BRFSS Child Asthma Call-back Survey and quality of life indicators from the NSCH tell us something about how well the asthma of children in New Hampshire is managed.

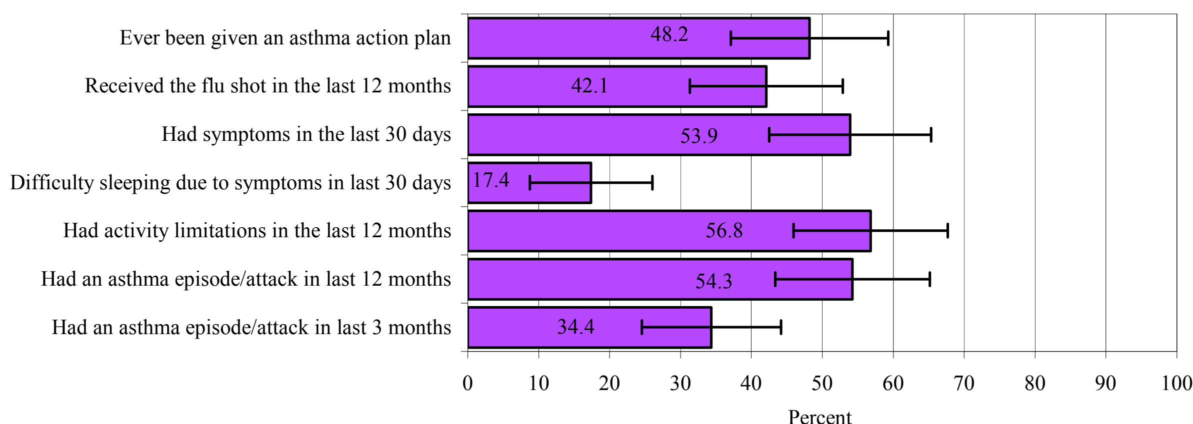
The following two indicators from the Call-back Survey are related to recommendations in the National Heart, Lung, Blood Institute (NHLBI) Expert Panel Report 3 (EPR3) *Guidelines for the Diagnosis and Management of Asthma*: individuals with asthma should receive an asthma action plan that should be reviewed at every visit, and they should also have a yearly flu shot because they are considered at risk for complications from influenza.

Data in Figure 2 on page 3 indicate that less than 50% of children with asthma in New Hampshire <18 years old have received an asthma action plan or a flu shot in the last year. This suggests that as many as half of children with asthma in New Hampshire may not be appropriately managed and that their asthma may not be under control.

Asthma Control:
Assessing individuals' asthma control using the NH BRFSS Child Asthma Call-back Survey is not as straight forward as assessing management. Table 1 on page 3 displays how asthma control is defined in the NHLBI EPR3 *Guidelines for the Diagnosis and Management of Asthma.* In order to be considered well controlled, an individual with asthma must meet the criteria for "well controlled" for each of the components of control listed next to "Impairment" in the table.

The NH BRFSS Child Asthma Call-back Survey includes questions that cover just the first four components of control. Therefore, the level of control reported below, which is calculated using this data source, is likely to be an underestimate.

Figure 2
Selected asthma management indicators among New Hampshire children <18 years old with current asthma



Source: 2006 & 2007 NH BRFSS Child Asthma Call-back Survey

Ever been given an asthma action plan - Responded "Yes" to "Has a doctor or other health professional EVER given you or [child's name] an asthma action plan?"
Received the flu vaccine in the last 12 months - Responded "Yes" to either "During the past 12 months, did [child's name] have a flu shot?"
Had symptoms in the last 30 days - Responded "1+ days" to "During the past 30 days, on how many days did [child's name] have any symptoms of asthma?"
Difficulty sleeping due to symptoms - Responded "1+ days" to" During the past 30 days, on how many days did symptoms of asthma make it difficult for [child's name] to stay asleep?"
Had activity limitations - Responded "A little, A moderate amount, or A lot" to "During the past 12 months, would you say you limited your usual activites due to asthma not at all, a little , a moderate amount or a lot?"
Had an episode/attack in the last 12 months - Responded "Yes" to "During the past 12 months, have you had an episode of asthma or an asthma attack?"
Had an episode/attack in the last 3 months - Responded "1+ episodes/attacks" to "During the past three months, how many asthma episodes or attacks have you had?"

Results from the 2006 and 2007 BRFSS Child Asthma Call-back Survey indicate that 68.8% (95% CI: 57.7-79.5) of children with current asthma in New Hampshire less than 18 years old are considered “not well” or “very poorly” controlled. Due to the small sample size, “not well” and “very poorly controlled” had to be combined for this analysis. As seen in Table 1, definitions for level of control vary by age. For the purposes of this analysis, the definitions used were for ages 12+. As a result, younger children are more likely to be identified as “well controlled” than if the definition for their age group were used.

Table 1
Assessing Asthma Control

Components of Control		Well Controlled			Not Well Controlled			Very Poorly Controlled		
		Ages 0-4	Ages 5-11	Ages 12+	Ages 0-4	Ages 5-11	Ages 12+	Ages 0-4	Ages 5-11	Ages 12+
Impairment	Symptoms	≤ 2 days/ week but not more than once a day		≤ 2 days/week	>2 days/week or multiple times on ≤ 2 days/week		>2 days/week	Throughout the day		
	Nighttime awakenings	≤ 1x/month		≤ 2x/month	>1x/month	≥ 2x/month	1-3x/week	>1x/week	≥ 2x/week	≥ 4x/week
	Interference with normal activity	None			Some limitation			Extremely limited		
	Short-acting $beta_2$-agonist use for symptom control	≤ 2 days/week			>2days/week			Several times per day		
	Lung function ▪ FEV_1 (predicted) or peak flow personal best	N/A	>80%	>80% predicted/ personal best	N/A	60-80%	60-80% predicted/ personal best	N/A	<60%	<60% predicted/ personal best

Source: Figures 12 and 15 from NHLBI *Guidelines for the Diagnosis and Management of Asthma- Expert Panel Report 3*

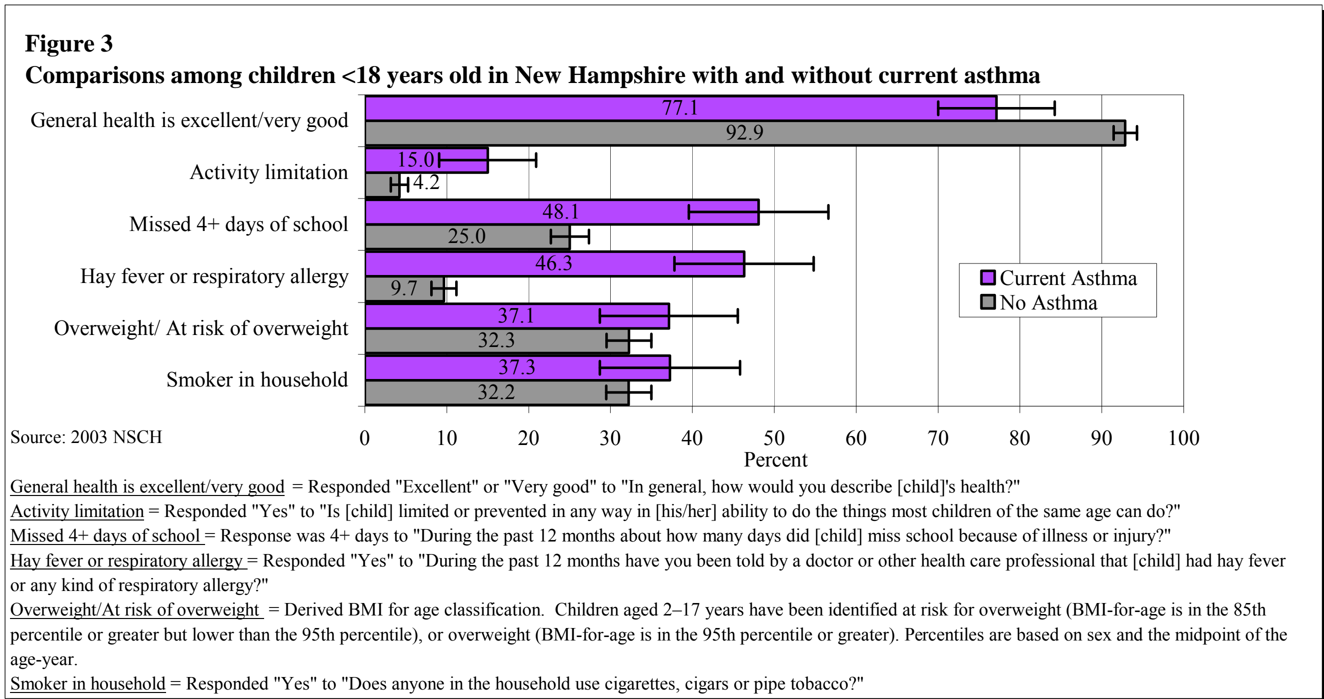
Quality of Life:

NHLBI measures of optimal asthma control that influence quality of life are: no missed school or work days and the ability to maintain normal activity levels, including exercise and other physical activities. As seen in Figure 3 below, responses to questions related to general health, activity limitation, and number of missed school days on the 2003 National Survey of Children's Health indicate that children with asthma experience a lower quality of life as well as conditions that put them at risk of poor management, which may lead to a lower quality of life.

Several studies have also shown that children with asthma tend to miss more school than their peers.[7, 8] Asthma symptoms can also result in tiredness, lethargy, reduced motivation, and problems with concentration. When children are neither able to attend school regularly or concentrate, they may not be able to keep up with their schoolwork and may fall behind, which may impact not only their present quality of life but their future as well. On average, children with asthma in New Hampshire miss approximately 2 more days of school per year than their peers without asthma (2003 NSCH).

Figure 3

Comparisons among children <18 years old in New Hampshire with and without current asthma



Source: 2003 NSCH

General health is excellent/very good = Responded "Excellent" or "Very good" to "In general, how would you describe [child]'s health?"
Activity limitation = Responded "Yes" to "Is [child] limited or prevented in any way in [his/her] ability to do the things most children of the same age can do?"
Missed 4+ days of school = Response was 4+ days to "During the past 12 months about how many days did [child] miss school because of illness or injury?"
Hay fever or respiratory allergy = Responded "Yes" to "During the past 12 months have you been told by a doctor or other health care professional that [child] had hay fever or any kind of respiratory allergy?"
Overweight/At risk of overweight = Derived BMI for age classification. Children aged 2–17 years have been identified at risk for overweight (BMI-for-age is in the 85th percentile or greater but lower than the 95th percentile), or overweight (BMI-for-age is in the 95th percentile or greater). Percentiles are based on sex and the midpoint of the age-year.
Smoker in household = Responded "Yes" to "Does anyone in the household use cigarettes, cigars or pipe tobacco?"

Parents and guardians of children with asthma were:

- Statistically significantly less likely to rate their child's general health as being excellent or very good;
- Approximately 3.5 times more likely to report their child as being limited or prevented in their ability to do the things most children their age do;
- Statistically significantly more likely to report their child missing four or more days of school than those without asthma;
- As likely to report that someone in the household smokes as those who had children without asthma.

Not surprisingly, these data indicate that almost half of all children with asthma were reported as having hay fever or a respiratory allergy in the last year.

Although these data do not indicate a difference in the percent of children who are overweight or at risk of overweight by asthma status, studies suggest that children who are overweight tend to have more severe asthma and are more likely to be admitted to the hospital following an emergency department visit.[9] Excessive body weight is also associated with an additional decrease in quality of life in children with asthma.[10]

The data also show that approximately one third of children live in a household with someone who smokes and that those with asthma are as likely to live with someone who smokes as those without asthma. Secondhand smoke is a known asthma trigger and should be avoided. In adults who have asthma, cigarette smoking has been associated with an increase in asthma severity and decreased responsiveness to inhaled corticosteroids.[11]

C. Selected Interventions: Asthma Education and Home Environments

Asthma Education

For the first time, there are data available that assess several asthma education topics that health care providers should cover with their patients.

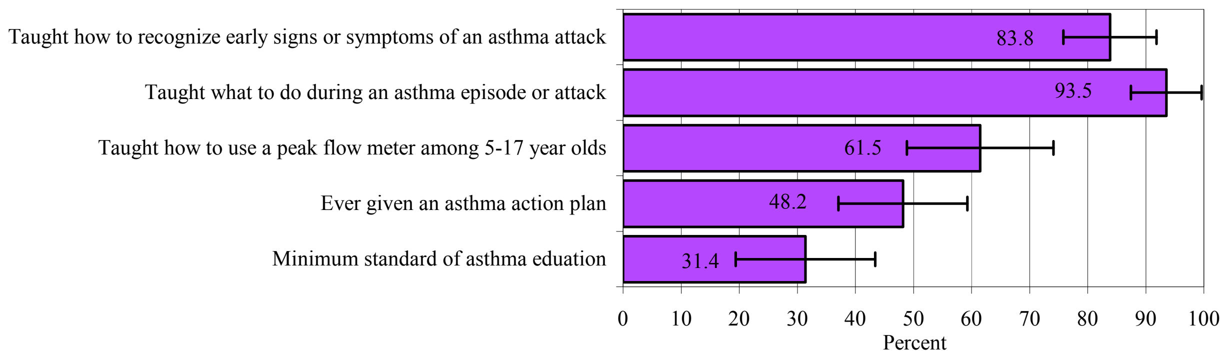
According to NHLBI EPR3 *Guidelines for the Diagnosis and Management of Asthma,* asthma education should be integrated into every office visit for patients with asthma. Asthma education includes, but is not limited to, teaching patients and parents:

- How to recognize early signs or symptoms of an asthma attack
- What to do during an asthma episode or attack
- How to use a peak flow meter
- How to use an inhaler if one is prescribed

In addition, according to the *Guidelines*, patients with asthma should receive an asthma action plan, which should be reviewed during each visit. Ideally these plans should be done in triplicate so the provider, family, and school have a copy.

Figure 4 below shows that children with asthma and their parents/guardians are receiving some asthma education; however, there is room for improvement in some of the asthma education indicators. It appears from the data that most health care providers are teaching their patients how to recognize early signs or symptoms of an asthma attack and what to do if one occurs. Of those who are prescribed an inhaler, approximately 94.7% (95% CI: 89.0-99.7) indicated that a health care provider told them how to use the inhaler and watched them use it. However, it appears health care providers are not as likely to teach patients how to use a peak flow meter to monitor their symptoms or complete asthma action plans with them. As a result, only 31.4% (95% CI: 19.4-43.4) of children with current asthma receive what could be characterized as a minimum standard of asthma education (see Figure 4, for the definition used to define a minimum standard of asthma education).

Figure 4
Asthma Education among New Hampshire children < 18 years old with current asthma



Source: 2006 & 2007 NH BRFSS Child Asthma Call-back Survey

The first three data point above indicates respondents answered "Yes" to "Has a doctor or other health professional ever taught you or [child's name]:
* How to recognize early signs or symptoms of an asthma episode?
*What to do during an asthma episode or attack?
*How to use a peak flow meter to adjust your daily medications?"

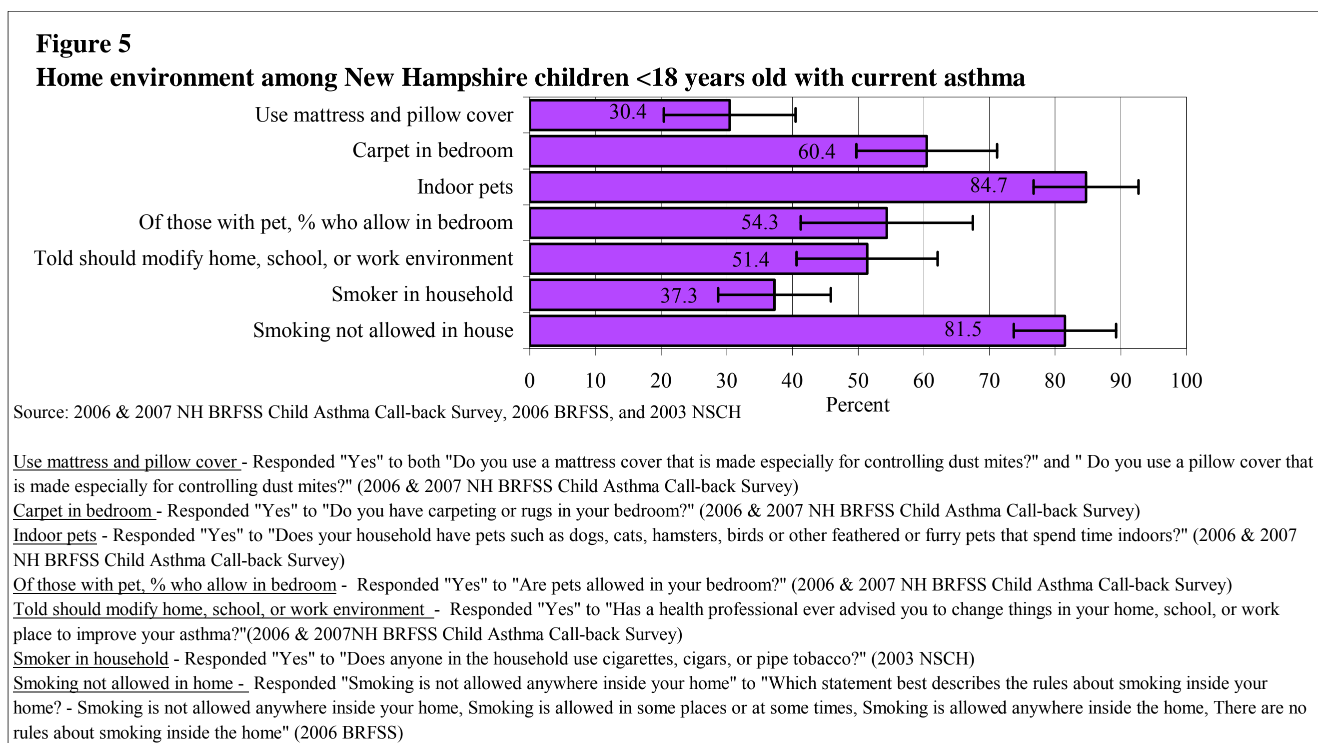
<u>Ever given an asthma action plan</u> - Parents/guardians of children 5-17 years old who responded "Yes" to "Has a doctor or other health professional EVER given you or [child's name] an asthma action plan?"
<u>Minimum standard of asthma education</u> - Parents/guardians of children 5-17 years old who responded "Yes" to all of the questions listed above and Parents/guardians of children 0-4 years old who responded "Yes" to all the questions above except for the question on "How to use a peak flow meter to adjust your daily medications?"

Home Environments

Reducing exposure to indoor environmental asthma triggers at home and school/daycare is key to successfully managing asthma. Examples of indoor environmental triggers include but are not limited to: dust mites, animal dander, secondhand smoke, mold, cockroaches, and nitrogen dioxide (e.g, NO_2 can be a byproduct of fuel-burning appliances, such as gas stoves, gas or oil furnaces, fireplaces, and wood stoves). According to the NHLBI EPR3 *Guidelines for the Diagnosis and Management of Asthma,* environmental triggers should be assessed at each office visit and indicated on an asthma action plan.

In Figure 5 below, there is a selected list of environmental triggers that can be assessed using the NH BRFSS Child Asthma Call-back Survey. In each case, except for smoking not being allowed in the house, the existence of asthma triggers (e.g., pets and secondhand smoke) is higher than desired from a disease management perspective, and the behaviors that could lead to a reduction of triggers are lower than desired (e.g., use of mattress and pillow covers, carpet-free bedroom). The survey has questions about mold and cockroaches, but the number of people responding to these questions was too small to get a reliable estimate.

Figure 5
Home environment among New Hampshire children <18 years old with current asthma



Source: 2006 & 2007 NH BRFSS Child Asthma Call-back Survey, 2006 BRFSS, and 2003 NSCH

Use mattress and pillow cover - Responded "Yes" to both "Do you use a mattress cover that is made especially for controlling dust mites?" and " Do you use a pillow cover that is made especially for controlling dust mites?" (2006 & 2007 NH BRFSS Child Asthma Call-back Survey)
Carpet in bedroom - Responded "Yes" to "Do you have carpeting or rugs in your bedroom?" (2006 & 2007 NH BRFSS Child Asthma Call-back Survey)
Indoor pets - Responded "Yes" to "Does your household have pets such as dogs, cats, hamsters, birds or other feathered or furry pets that spend time indoors?" (2006 & 2007 NH BRFSS Child Asthma Call-back Survey)
Of those with pet, % who allow in bedroom - Responded "Yes" to "Are pets allowed in your bedroom?" (2006 & 2007 NH BRFSS Child Asthma Call-back Survey)
Told should modify home, school, or work environment - Responded "Yes" to "Has a health professional ever advised you to change things in your home, school, or work place to improve your asthma?"(2006 & 2007NH BRFSS Child Asthma Call-back Survey)
Smoker in household - Responded "Yes" to "Does anyone in the household use cigarettes, cigars, or pipe tobacco?" (2003 NSCH)
Smoking not allowed in home - Responded "Smoking is not allowed anywhere inside your home" to "Which statement best describes the rules about smoking inside your home? - Smoking is not allowed anywhere inside your home, Smoking is allowed in some places or at some times, Smoking is allowed anywhere inside the home, There are no rules about smoking inside the home" (2006 BRFSS)

Cost-benefits of Asthma Education and Environmental Interventions

The literature on the health benefits of asthma education and environmental interventions is extensive.[12, 13, 14] However, only a few studies have examined the financial benefits of these interventions. The Asthma Regional Council of New England in partnership with the University of Massachusetts Lowell and Children's Hospital Boston developed a business case for asthma education and environmental interventions. The business case highlights studies that show asthma education saves $7 to $36 for every $1 invested. It also indicates that the cost of environmental interventions is comparable to the cost of prescriptions for someone with mild asthma and therefore a reasonable investment.[15]

Several health plans across the county have also conducted pilot programs to assess the health outcomes and cost benefits of asthma education and environmental interventions in conjunction with primary and specialty care. Pilot programs have seen improved health outcomes and decreased costs, resulting in some insurers offering these interventions as part of their benefits package.[15] The health and cost benefits together make a compelling case for health plans to reimburse for these interventions and for providers to offer asthma education on a routine bases and make referrals for home visits and environmental assessments.

D. Discussion

The data presented in this report indicate:

- Nearly 7 out of 10 children with asthma have poorly controlled asthma.
- Children with asthma have a significantly lower quality of life than those without asthma.
- Only 31.4% of children with asthma receive what could be characterized as a minimum standard of asthma education; significant improvements could be made by increasing the number of children who receive an asthma action plan, a yearly flu shot, and instruction in how to monitor their asthma.
- The impact of indoor environmental asthma triggers and the need to minimize them.

Asthma control is influenced not only by how well it is managed through medications and other medical interventions (i.e., receiving the flu shot) but also by how well children and parents are educated about asthma and the environment in which they live, work, and go to school. Parents and children who receive comprehensive asthma education are better equipped to recognize early signs and symptoms of an attack and know what to do if one occurs, identify their asthma triggers and avoid them, use proper technique for taking medications, monitor symptoms using a peak flow meter, and use their asthma action plan to identify what actions they should take based on their symptoms.

Studies indicate that the use of written asthma action plans leads to reductions in asthma exacerbations, missed school days, and acute care visits.[16] Better asthma control and management and reduced exposure to environmental asthma triggers (e.g., dust mite, mold) will reduce adverse outcomes and result in improvements in quality of life.[17-19] While barriers exist to providing comprehensive asthma education in primary care practices and emergency rooms, the benefits of this "best practice" should drive health plan decisions concerning services reimbursed and provider decisions concerning what they do when they see a child with asthma, whether for a well-child or acute visit.

Recommendations

- Health plans need to reimburse for clinical and environmental "best practices" as outlined in the NHLBI Expert Panel Report 3 *Guidelines for the Diagnosis and Management of Asthma,* including asthma education and home environmental assessment.
- Primary care and acute care providers need to increase their adherence to the NHLBI Expert Panel Report 3 *Guidelines.*
- Primary care practices and hospitals need to increase the number of certified asthma educators delivering comprehensive asthma education.
- All health care providers need to increase their use of asthma action plans (and share them with families and school nurses) and other effective management tools.
- Health care providers need to address patient overweight/at risk of overweight and exposure to tobacco smoke with families.

E. Data Sources

The New Hampshire Behavioral Risk Factor Surveillance System (BRFSS) is an annual, statewide telephone survey of a random sample of New Hampshire household residents aged 18 and older that produces estimates representative of the New Hampshire population living in households. From 2005-2007, New Hampshire added two optional modules to the NH BRFSS, the Random Child Selection Module and the Childhood Asthma Prevalence Module. These modules combined allow New Hampshire to calculate the prevalence of asthma among children less than 18 years old.

The NH BRFSS Child Asthma Call-back Survey is administered when someone indicates on the BRFSS that a child selected in the Random Child Selection Module has asthma and agrees to be contacted again to respond to additional asthma- specific questions. It was designed to describe the health, socioeconomic, behavioral and environmental predictors associated with better control of asthma.

The National Survey of Children's Health (NSCH) is a random telephone survey of households with children under 18 years of age funded by the Maternal and Child Health Bureau of the U.S. Department of Health and Human Services. The National Center for Health Statistics at the Centers for Disease Control and Prevention conducted this survey to estimate national and state level prevalence for a variety of physical, emotional and behavioral health indicators. Questions on asthma prevalence and health-related quality of life were included on the survey. The respondent was the parent or guardian of the child living in the surveyed household. A total of 102,353 surveys were completed nationally; 1,925 of those were done in New Hampshire. Survey results were weighted to represent the population of non-institutionalized children ages 0-17 in each state and nationally.

Limitations

Each of these data sets has their limitations. Because the BRFSS, BRFSS Asthma Child Call-back Survey and NSCH are based on self-report or reporting by a parent or guardian, there may be inaccurate recall by respondents, which may lead to response bias and recall bias and thus result in under- or over-estimation of specific behaviors or conditions. These data are weighted to represent the population of non-institutionalized children in New Hampshire. Since the data represent a sample of individuals, 95% confidence intervals are included. The 95% CI represents the range of values that, with 95% certainty, includes the true value for the entire population of non-institutionalized children.

Children who are institutionalized or live in households without a landline telephone are not represented by the surveys used in this report.

III. Where to Go for More Information

For more information on the data presented here or to receive a copy of other reports on asthma, contact the New Hampshire Asthma Control Program at (800) 852-3345 ext. 0856.

- For a copy of the most recent edition of national guidelines for asthma, *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma,* visit the **National Heart, Lung, and Blood Institute** website at www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf.
- To schedule a continuing medical education session from the *Improving Asthma Management Series,* call the **Southern New Hampshire Area Health Education Center** at (603) 895-1514 or visit their website at www.snhahec.org for more information.
- Visit www.AsthmaNow.net, New Hampshire's website for asthma. The site provides an **Asthma Toolbox** that is particularly useful to people doing asthma education. There is also information on asthma and the workplace, asthma care and management, asthma and the environment, and resources for adults, parents, teens, children and providers. Use the AsthmaNow.net website to link to other helpful web pages and sites.
- Go to the **Centers for Disease Control and Prevention** website at www.cdc.gov/asthma for data and information on how asthma is being addressed nationwide.

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Pediatric Asthma Management and Control Report
Evaluation Form

The New Hampshire Asthma Control Program would appreciate your feedback on the *Pediatric Asthma Management and Control Report*. Your feedback will help us improve future reports.

1. Please select all that apply:
   a. I have a child with asthma
   b. I am a medical provider
   c. I am a healthcare administrator
   d. I am a school nurse
   e. I work for an insurer
   f. I work for a state agency interested in asthma
   g. I work for a federal agency interested in asthma
   h. I work for a non-profit organization interested in asthma
   i. I work for a for-profit organization interested in asthma
   j. Other (specify)_________________

2. Where did you see the *Pediatric Asthma Management and Control Report*?
   a. At a meeting hosted by the New Hampshire Asthma Control Program
   b. At another meeting
   c. At the AsthmaNow.net website
   d. At the NH DHHS website (www.dhhs.state.nh.us)
   e. At another website
   f. At a conference
   g. In an email
   h. Other (please specify)____

3. Have you read any other data briefs or reports produced by the New Hampshire Asthma Control Program?
   a. Yes
   b. No
   c. Don't Know

Using the five-point scale, please rate the degree to which you agree with each statement.	**Strongly Disagree**	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
4. The report is easy to read.	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
5. The report contains new information.	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
6. The report provides useful information.	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

7. What would make this report more useful? Please be specific. _________________________________

____

____

-Turn Over-

8. How do you plan on using this information?

a. To increase my knowledge about pediatric asthma management and control issues
b. To help raise awareness about pediatric asthma management and control issues
c. To support implementing practice changes or programs to improve pediatric asthma management and control
d. To support related legislation
e. To apply for a grant
f. Other (please specify)____

9. What did you like most about the report? ____

____

____

10. What did you like least about the report?____

____

____

11. What other asthma topics would you like to see a report on (e.g., Smoking and Asthma, Asthma Co-morbidities, Cost of Asthma)? ____

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Thank you for taking the time to complete this evaluation. Completed forms can be mailed, faxed, or emailed to:

Elizabeth Traore
Asthma Program Epidemiologist/ Evaluator

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