



ASTHMA IN NEW ENGLAND

Part II: Children

**A Report by the
New England Asthma Regional Council**

CONTACT:
Laurie Stillman, Executive Director
Asthma Regional Council
The Medical Foundation
622 Washington Street, 2nd fl
Dorchester, MA 02124
(617) 451-0049 x504
www.asthmaregionalcouncil.org
lstillman@tmfnet.org

January 2004

Acknowledgments

This report was commissioned by the New England Asthma Regional Council (ARC), a program of The Medical Foundation. ARC's mission is:

“To reduce the impact of asthma on children and families across New England through collaborations of health, housing, education, and environmental organizations, with particular focus on the contribution of schools, homes, and communities to asthma and to the disproportionate impact of the disease on low income and/or minority populations.”

ARC's Executive Committee:

Chair:

Betsy Rosenfeld, JD, U.S. Department of Health and Human Services, Region I (New England)

Members:

Suzanne Condon, MS, Massachusetts Department of Public Health

Carmine DiBattista, formerly of Connecticut Department of Environmental Protection

Michael Kucsma, Maine Department of Education

Megan Sandel, MD, Boston Medical Center and DOCS4KIDS

Eileen Storey, MD, MPH, University of Connecticut Health Center

Executive Director:

Laurie Stillman, Asthma Regional Council

The Asthma Regional Council, the U.S. Department of Health and Human Services, Region I (New England), and the six New England states would like to acknowledge ORC Macro, the BRFSS contractor for all six New England states, for adding the childhood asthma questions in 2001 at no additional charge. We also want to thank the Jessie B. Cox Charitable Trust, a New England philanthropy, as well as Children's Hospital Boston for helping to underwrite the cost of the development of this report, and the Centers for Disease Control and Prevention (CDC) for providing funding to the states to conduct the Behavioral Risk Factor Surveillance System (BRFSS).

The cooperation and efforts of the following state health department staff are also acknowledged:

BRFSS Coordinators: Diane Aye, MPH, PhD (CT), Judith Graber, MS (ME), Zi Zhang, MPH, MD (MA), Jo Porter, MPH (NH), Jana Hesser, MA, PhD (RI), Rodney McCormick, PhD (VT)

Other State Health Department Staff: Patricia Miskell, MPH (CT), Kathy Tippy, MPH (ME), Robert Knorr, PhD (MA), Jonina Schonfeld, JD (MA), Andrew Chalsma (NH), Lindsay Dearborn, MEd, MPH (NH), Jody Wilson, MPH (NH), John Fulton, PhD (RI), Jessie Brosseau, MPH (VT), Allison La Pointe, MPH (VT).

CDC Asthma Program: Jeanne Moorman, MS

Data analysis provided by Mary Adams, MS, MPH, www.ontargethealthdata.com

To find out more about the New England Asthma Regional Council, visit our website at:
www.asthmaregionalcouncil.org

Asthma in New England

A Report by the New England Asthma Regional Council

OVERVIEW

Asthma is characterized by chronic inflammation of the airways that causes episodes of wheezing, coughing, and difficulty in breathing. It is among the most common diseases in the U.S. today, with an estimated 15 million cases nationwide. The disease often begins in childhood and is one of the leading causes of school absence, emergency room visits, and hospitalizations. The total annual cost of asthma in the U.S. in 2000 was estimated to be \$12.7 billion,¹ including \$3.2 billion for the cost of treating asthma in children less than 18 years of age.²

The causes of asthma are unknown, but we do know that a number of factors can influence the disease, including the indoor and outdoor environment. Environmental factors such as air pollution, pollen, mold and mildew, dust, pets, cigarette smoke, and certain respiratory illnesses can trigger asthma attacks. There is speculation that environmental conditions may even contribute to asthma's onset, but there is still a great deal more to be learned about what causes and exacerbates the disease. Recognizing the urgent need to better understand the asthma epidemic and its environmental influences, the New England Asthma Regional Council (ARC) was launched in 2000 by federal officials in the region to address the environmental aspects of asthma along with their state, community and academic partners in public health, housing, education and the environment.

One of ARC's goals is to build a robust asthma surveillance system across New England to better understand the extent of the disease in our region and how it may be influenced by common environmental factors. In order to make these connections, we first need to determine how, when and where asthma manifests itself across our six states' geographical boundaries. However, individual states have historically defined and collected asthma data differently, so comparisons made on a state-by-state basis have been difficult to do. Collecting uniform data across the region is a first step towards a goal of analyzing information in a consistent manner so that prevalence comparisons can be studied in meaningful ways and links to the environment can be researched, understood and addressed.

To better understand the burden of asthma across the New England region, ARC and the U.S. Department of Health and Human Services, Region I (New England) convened public health surveillance professionals from the six New England states' Departments of Public Health to begin a collective process of investigating and analyzing adult and childhood asthma rates in a uniform fashion. To that end, the states agreed to collect and analyze asthma data using the Behavioral Risk Factor Surveillance System (BRFSS) in 2001. The BRFSS is a telephone survey of randomly selected non-institutionalized adults conducted in all 50 states and some territories and is coordinated by the Centers for Disease Control and Prevention (CDC).³

The 2001 BRFSS core survey included questions on adult asthma that were asked in all participating states and territories. The results of ARC's analysis on adult asthma prevalence in the six New England states were released in May 2003 in a groundbreaking report entitled *Asthma in New England Part I: Adults*.⁴ That report estimated that nearly 1 million adults in New England currently have asthma. The analysis further discovered that for the New England

region as a whole, the self-reported adult asthma rate was 8.9%, significantly higher than the combined rate for the other 44 U.S. states and three territories that participated, which was 7.1%.

Because the 2001 core BRFSS did not address childhood asthma, ARC and the regional office of the US DHHS negotiated with the six New England state health departments to add two common questions in their states to ascertain childhood asthma as well. Such a cooperative endeavor across an entire federal region appears to be a unique use of the BRFSS. The results of that collaboration addressing childhood asthma in New England are reported below.

METHODS

Data were collected during the calendar year 2001 using two questions added to the core BRFSS survey. The New England BRFSS questions about childhood asthma addressed 1) the number of children in the household who had ever been diagnosed with asthma, and 2) the number of children who still had asthma. Information was provided by a randomly selected adult respondent in all households with at least one child under age 18. Technical details of the BRFSS methods and the actual questions, which varied slightly in Rhode Island, are in the Appendix. Because only a few states outside New England collected BRFSS data on childhood asthma in 2001, no comparison could be made with the rest of the U.S.

Three asthma prevalence rates were determined and are reported based on the two questions asked. First, a household childhood asthma rate was calculated. This is expressed as the percent of households with children in which one or more had ever been diagnosed with asthma. The rate tells us the percentage of households in the six New England states that ever had at least one child with asthma. In addition, two measures of the prevalence rate of asthma among children were determined, 1) to represent children “ever told they had asthma” and 2) to represent those who “still had asthma”. These measures are referred to as “lifetime” and “current” childhood asthma rates, respectively, following CDC convention.

While “current asthma” is frequently the measure of choice for adults, and was the measure used for adults in Part I of this report, we focused in this Part II report on lifetime asthma prevalence rates for children. This measure was favored for examining childhood asthma for two reasons. First, it was felt that lifetime prevalence was a better measure of the burden of asthma on families who had to cope with this disease at some point in their lives. Second, it was unclear if adult respondents would be able to correctly identify whether the child still had asthma or not. Since the clinical definition of asthma is more complex than just recalling when the last asthma attack occurred, respondents might respond incorrectly, leading to a low estimate for current asthma. Although not a major consideration in the choice of measure, the National Health Interview Survey also reports lifetime asthma rates for children, and could provide some context for the New England results. On the other hand, because asthma symptoms can sometimes abate over time, some current asthma rates are also included in this report.

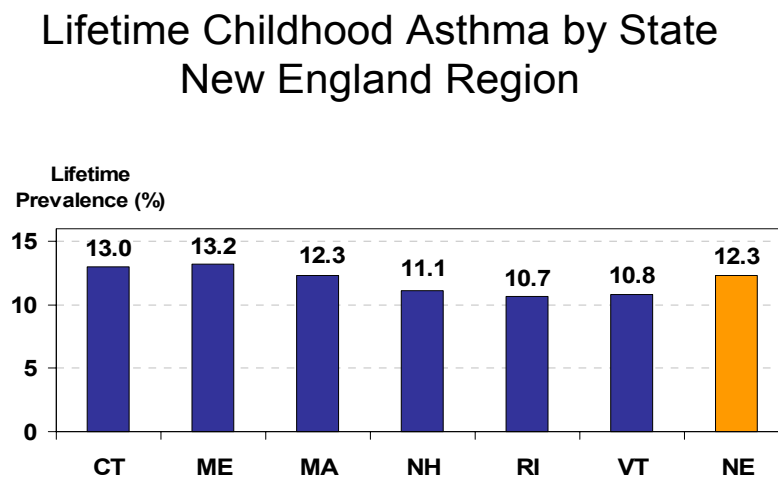
RESULTS

A. Childhood Asthma Rates for the New England Region and States

Among New England households reporting children younger than 18 on the 2001 BRFSS, nearly one in every five of those households reported that one or more children in the household had ever been diagnosed with asthma. This represents 19.3% (95% CI 18.4-20.3)ⁱ of households with children, or approximately 350,000 households in New England that have been affected by a child with asthma. Selected demographics of the households with children are shown in the Appendix. All other results presented in the tables and charts in the body of this report are based on numbers of children, rather than of households.

In 2001, the overall lifetime prevalence rate for childhood asthma in New England was 12.3% (95% CI 11.6-12.9), representing an estimated 411,200 children age 17 and younger. Lifetime childhood asthma rates were similar in all New England states, ranging from 10.7% in Rhode Island to 13.2% in Maine (Figure 1/Table 1).

Figure 1.



Lifetime asthma prevalence represents those children under 18 years of age who were ever told they had asthma. Lifetime child asthma rates were similar for all six New England states, ranging from 10.7% in Rhode Island to 13.2% in Maine.

Source: 2001 BRFSS.

ⁱ Confidence intervals (CI) are provided in parentheses following point estimates in the text, and also in Tables. The CI is a range of values around the estimated value within which the “true” value probably lies. In this report, CI’s that did not overlap were used to indicate significantly different rates between or among states or demographic groups.

In contrast to the 2001 regional *lifetime* childhood asthma prevalence rate stated above, the regional *current* childhood asthma rate in 2001 was 8.7%. To calculate this regional rate for all six New England states, a method of extrapolation was used (see Appendix for details). Current asthma rates for each of the six New England states ranged from 7.6% to 9.3%. Based on these *current* rates, the number of children with *current* asthma was estimated to be 288,100 (Table 1). The number of children with current asthma represents 70.9% of all children with lifetime asthma, indicating that about 30% of children who had been diagnosed with asthma no longer had it. This rate for the individual states ranged from 68.8% in New Hampshire to 76.5% in Vermont.

All other results are reported as “lifetime asthma”, based on the results for children “ever told they had asthma”.

Table 1
Asthma in New England Children

	Lifetime Childhood Asthma % (95% CI)	Estimated No. of Children with Lifetime Asthma	Current Childhood Asthma % (95% CI)	Estimated No. of Children with Current Asthma
State				
Connecticut	13.0% (11.9-14.1)	109,300	8.8% (7.9-9.7)	74,300
Maine	13.2% (11.3-15.1)	39,800	9.3% (7.7-11.0)	28,100
Massachusetts	12.3% (11.1-13.6)	185,300	8.8% (7.7-9.9)	131,700
New Hampshire	11.1% (9.8-12.5)	34,500	7.6% (6.5-8.7)	23,400
Rhode Island	10.7% (9.2-12.1)	26,400	7.6%* (N/A)	18,700
Vermont	10.8% (9.6-12.0)	15,900	8.1% (7.0-9.2)	11,900
All New England	12.3% (11.6-12.9)	411,200	8.7%* (N/A)	288,100
“Lifetime” asthma represents children “ever told” they had it, while “current” indicates those who “still have it” in 2001. The numbers of children were estimated from lifetime and current asthma rates and the number of children in each state from the 2000 census. Source: 2001 BRFSS.				

*See Appendix for Rhode Island and regional rate calculations

B. Disparities in Childhood Asthma in New England

Additional analyses were conducted to examine the association between lifetime childhood asthma and demographic and other relevant variables. Because most of the information collected on the BRFSS relates directly to the adult respondent, only a limited amount of demographic information about children in the household could be ascertained. These factors include household income, the number of children in the household, and the number of adults in the household. Childhood asthma rates by the race/ethnicity and smoking status of the adult respondent and whether or not the adult had asthma are also reported. These analyses were included even though no information was available on the race/ethnicity of the child or the relationship between the child and the adult respondent.

The results for demographic and other variables are presented in Table 2 and Figures 2-5 on the following pages. Selected highlights of those results are presented below. All bulleted comparisons represent differences that were statistically significant.

- Higher lifetime childhood asthma rates were reported in households in which the adult respondent was non-Hispanic black (17.5%) or Hispanic (17.6%) than in households in which the adult respondent was white (11.4%) (Table 2 and Figure 2).
- Children in households with an income less than \$25,000 (17.5%) were more likely than other children to be reported to have lifetime asthma (Table 2 and Figure 3).
- Nearly three times as many children were reported to have lifetime asthma in households in which the adult respondent reported current asthma than in households in which the adult did not have asthma (29.0% vs. 10.3%) (Table 2).
- Households in which there was only one adult present were more likely to report a child with lifetime asthma (16.3%) than households with two (11.1%) or three (11.8%) adults (Table 2 and Figure 4).
- If the adult respondent was a current smoker, the childhood lifetime asthma rate was higher than was the case if the respondent did not smoke (14.7% vs. 11.5%) (Table 2).

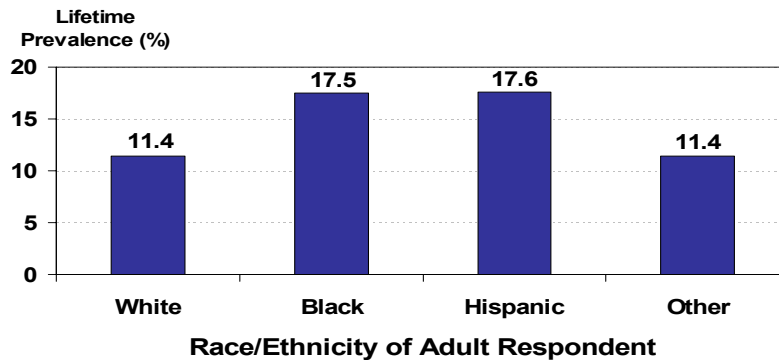
Table 2
Lifetime Asthma among New England Children
(n=10,579)

	Lifetime Childhood Asthma			Lifetime Childhood Asthma	
	Prevalence (%)	Confidence Interval		Prevalence (%)	Confidence Interval
Race/ethnicity of adult respondent			Household income		
White	11.4	10.7-12.1	<\$25,000	17.5	14.9-20.1
Black	17.5	13.7-21.2	\$25-50,000	13.3	12.0-14.6
Hispanic	17.6	14.9-20.3	\$50-75,000	12.1	10.6-13.6
Other	11.4	8.5-14.4	≥\$75,000	9.3	8.3-10.4
No. of adults in household			No. of children in household		
1	16.3	14.6-18.1	1	13.8	12.5-15.2
2	11.1	10.3-11.9	2	10.7	9.8-11.6
3	11.8	9.8-13.8	3	14.1	12.4-15.8
4 or more	13.0	9.7-16.3	4 or more	11.9	9.7-14.0
Adult respondent currently has asthma			Adult respondent currently smokes		
Yes	29.0	25.9-32.2	Yes	14.7	13.2-16.2
No	10.3	9.7-11.0	No	11.5	10.7-12.2

- “Lifetime asthma” represents results for those children younger than 18 years who were reported to have been “ever told they had asthma.”
 - All results represent significant differences between two or more groups, as denoted by confidence intervals that do not overlap. For example, there is a significant difference between the rates for households with incomes <\$25,000 and all other household income groups, but not between the \$25-\$50,000 and the \$50-\$75,000 groups.
 - Black, white and other races (e.g. Asian) are non-Hispanic; Hispanic ethnicity includes all races.
- Source: 2001 BRFSS.

Figure 2.

Lifetime Childhood Asthma by Race/Ethnicity of Adult Respondent New England Region

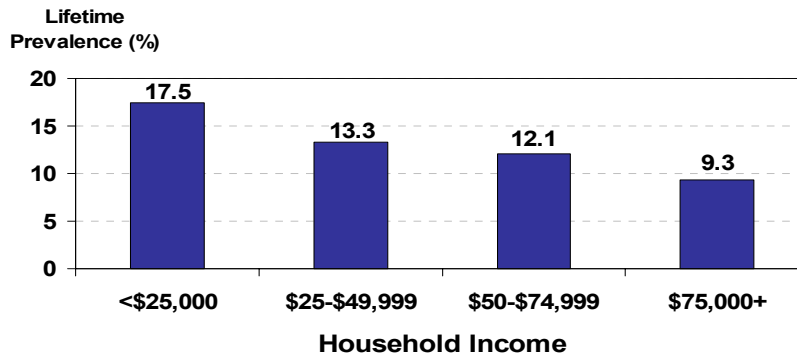


Lifetime asthma prevalence represents those children under 18 years of age who were ever told they had asthma. Black and Hispanic adults were significantly more likely to report children in their household that had ever been told they had asthma, compared to non-Hispanic white adults.

Source: 2001 BRFSS.

Figure 3.

Lifetime Childhood Asthma by Household Income New England Region

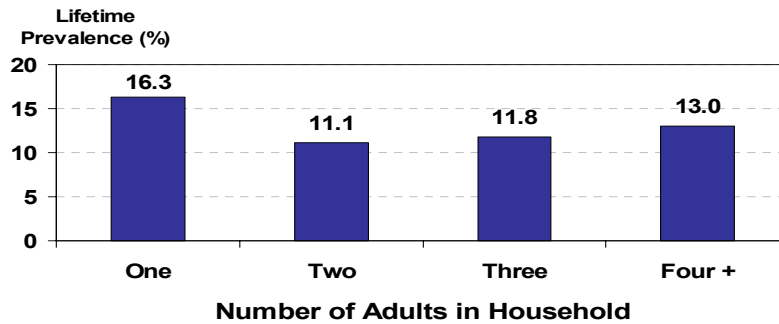


Lifetime asthma prevalence represents those children under 18 years of age who were ever told they had asthma. Lifetime childhood asthma rates were inversely related to household income, with significant differences between all income groups except the two middle income groups.

Source: 2001 BRFSS.

Figure 4.

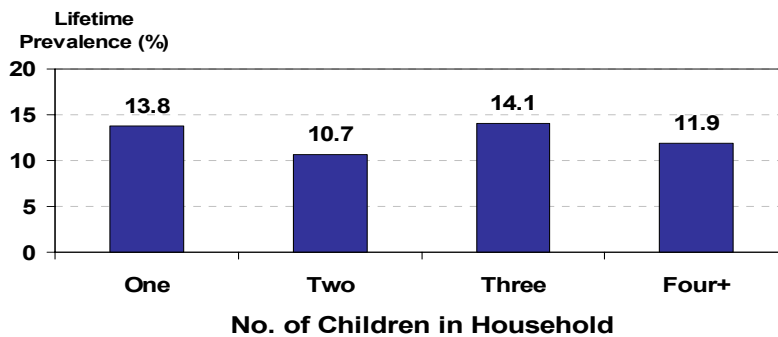
Lifetime Childhood Asthma by Adults in Household New England Region



Lifetime asthma prevalence represents those children under 18 years of age who were ever told they had asthma. Compared to children in households with two or three adults, those living with only one adult were significantly more likely to have been told they had asthma. Source: 2001 BRFSS.

Figure 5.

Lifetime Childhood Asthma by Number of Children in Household New England Region



Lifetime asthma prevalence represents those children under 18 years of age who were ever told they had asthma. Although significant differences were found, no pattern was observed between the number of children in the household and lifetime childhood asthma rates. Source: 2001 BRFSS.

C. Total Asthma Burden in New England

Combining the BRFSS results for adults and children, an estimated 1.2 million New England residents currently had asthma in 2001, and 1.7 million residents had it in their lifetime. These figures include an estimated 941,500 adults and 288,100 children who currently have asthma and an estimated 1.3 million adults and 411,200 children who have had asthma in their lifetimes. Lifetime and current asthma prevalence rates for New England children were quite similar to the corresponding rates for adults in each state, as shown in Table 3.⁴

Table 3.
Childhood and Adult Asthma Rates
New England Region

State	*Current Adult Prevalence % (95% CI)	Current Childhood Prevalence % (95% CI)	**Lifetime Adult Prevalence % (95% CI)	Lifetime Childhood Prevalence % (95% CI)
Connecticut	7.9 (7.2-8.6)	8.8 (7.9-9.7)	12.3 (11.4-13.3)	13.0 (11.9-14.1)
Maine	9.4 (8.1-10.8)	9.3 (7.7-11.0)	12.6 (11.2-14.2)	13.2 (11.3-15.1)
Massachusetts	9.5 (8.7-10.3)	8.8 (7.7-9.9)	13.1 (12.2-14.0)	12.3 (11.1-13.6)
New Hampshire	8.4 (7.5-9.5)	7.6 (6.5-8.7)	12.5 (11.3-13.7)	11.1 (9.8-12.5)
Rhode Island	9.4 (8.3-10.6)	7.6 (N/A)	12.1 (11.0-13.4)	10.7 (9.2-12.1)
Vermont	8.8 (7.9-9.9)	8.1 (7.0-9.2)	12.1 (11.0-13.3)	10.8 (9.6-12.0)
All New England	8.9 (8.5-9.4)	8.7 (N/A)	12.7 (12.2-13.2)	12.3 (11.6-12.9)
<p>*Adult current asthma prevalence rates were reported in Part I of <i>Asthma in New England</i>.⁴ ** Lifetime adult prevalence rates were determined from the 2001 BRFSS data; methods were similar to those reported in Part I, but report adults ever told they had asthma.⁵ N/A: not available. Lifetime and current asthma rates for children were similar to the corresponding rates for adults. Adults are 18 years and older, while children are less than 18 years of age. Source: 2001 BRFSS.</p>				

DISCUSSION

Over one in every nine children in New England, and nearly one in every five households with children, has been affected by asthma, as indicated by an adult reporting a child in the household who had been told they had asthma. Although no comparison could be done between New England childhood asthma rates and the rest of the U.S., as was done for adults, the childhood asthma results suggest a significant burden. Results for current and lifetime asthma among New England children were similar to the corresponding state rates among adults, although the significance of that finding is not clear.

Even with the limited amount of demographic information available directly related to children, it was clear that asthma affects some children in New England disproportionately. For example, childhood asthma rates were inversely associated with household income, and were highest among households with incomes less than \$25,000. Results for adults also showed a higher asthma rate among households in the lowest income group, although adult asthma rates were similar among the three highest income groups.⁴ Childhood asthma rates in New England were also higher in households which had a black or Hispanic adult respondent. This result is in

contrast to the result for adults, where it was noted that rates for black, Hispanic, and non-Hispanic white adults were similar. The reasons for this inconsistency are unknown and suggest the need for further study. The result for children is consistent with the higher rate for lower income households, which may be due to the fact that minority households tend to have lower incomes.⁶ Single parent households (those with one adult who was presumed to be a parent or guardian) also had high childhood asthma rates. Childhood asthma rates also varied by the number of children in the household, although no trend was evident. The reason for this finding was not clear.

A number of factors associated with asthma may be responsible for the variations in lifetime childhood asthma rates noted in Table 2 and discussed above. Environmental tobacco smoke may be a factor, as indicated by higher childhood asthma rates in households in which the adult respondent reported current smoking. Genetic factors may be involved, as suggested by the exceptionally high childhood asthma rates in households where the adult respondent reported current asthma. Of course, that could also be due to exposure to similar environmental factors in the household, or an increased awareness of asthma resulting in a reporting bias. The quality and age of the housing stock, which might vary by household income, may also contribute to differences in asthma rates. Continued investigation of these and other issues are needed to better understand the dynamics behind the results reported here. In particular, regional and local childhood asthma prevalence data would be a useful addition to mortality, hospitalization, emergency department, and other data available at the local level. While limited sub-state data are available from the BRFSS, that information would be best obtained from state and local sources.

These results are subject to a number of limitations. The BRFSS is designed to survey adults, and its utility for the collection of data on children has not been determined. Asthma was defined by self-report and the validity of this measure on the BRFSS is unknown. Some children with lifetime asthma who did not have current asthma may represent a misdiagnosis. No information was available on the relationship between the adult respondent and the children in the household for whom the information was provided. Non-parental adults may not be fully aware of health conditions of children in the household, although they could have used the option to not answer the questions. The race and ethnicity of the child was not known. Response rates on the BRFSS have been decreasing over time, and low response rates could produce bias in the results. There is no way to know if the results for children based on responses for the adults who did not respond would be similar to those that did participate. Although telephone coverage rates in New England are generally high (>95%), results exclude adults in households without telephones, who are likely to have lower incomes than those surveyed.

Despite the limitations of the BRFSS, many of the results reported here for New England children are supported by results from the 1998 and 2000 Health Interview Surveys (HIS) for the United States.^{7,8} That national survey is conducted in person and collects information about specific children in the household, thus avoiding some of the limitations of the BRFSS. On the other hand, the data are not reported by state, and the total sample size for the HIS is much smaller than the total number of BRFSS interviews collected in all participating states. In 2000, the HIS found that 12.4% of all children had ever been told they had asthma, ranging from 7.8% for children younger than 4 years, to 16.2% for 12-17 year olds. That survey found significantly higher asthma rates for non-Hispanic black (16%), but not Hispanic (10%) children, compared with non-Hispanic white children (12%). They also found significantly higher lifetime asthma rates for children in households with incomes less than \$20,000 (15.2%) compared with incomes

greater than \$20,000 (11.7%). Children in households with a mother but no father were more likely to have ever been told they had asthma than those in two-parent families (16.6% and 10.9% respectively). Notably, the HIS also found a high lifetime childhood asthma rate in the Northeast in both 1998 and 2000 (13.9% and 13.2% respectively), although it was not significantly higher than in other regions (range: 10.7% in the West in 1998 to 12.7% in the South in 2000). While the Northeast rate from the HIS was slightly higher than the New England rate reported here, that may be due to the inclusion of additional states beyond New England, sampling issues (e.g. a larger confidence interval), or may simply reflect the slightly lower rates for some self-reported items noted on the BRFSS.⁹

Since these BRFSS data were gathered in 2001, significant progress has been made in childhood asthma surveillance using that instrument. A standard childhood asthma module (essentially the questions asked in New England, as shown in the Appendix) has been offered by CDC and used by 21 or more states in 2002 and 2003. Including those states that asked these questions in 2001, at least 37 states and 2 territories have collected childhood asthma data on the BRFSS in one or more years. When those data are analyzed, they will provide a valuable source of comparison data for New England. CDC is considering long range changes to the sampling strategy to collect more data about one randomly selected child in each household. Information on the age, gender, and race/ethnicity of the child would greatly enhance the value of childhood asthma data. For example, if the age of the child is known, then age specific prevalence rates could be calculated to determine if asthma rates change with increasing age. It is clear from the popularity of the child asthma module and CDC's plans that there is widespread recognition of the need for a coordinated surveillance system of childhood asthma. The BRFSS should be considered one component of such a surveillance system, particularly useful for comparing state rates or trends over time.

RECOMMENDATIONS OF THE ASTHMA REGIONAL COUNCIL

To date, the vast expenditure of research dollars on asthma has been geared to a biomedical response, focused primarily on disease management through pharmacology. Fortunately, we have made great strides in this area, and as a result, the quality of life for many with asthma has greatly improved. We need to continue to ensure that our efforts to treat asthma are given attention, especially for our highest risk populations.

But we also need to know more about what causes asthma in the first place, why it is growing at such alarming rates, and which communities are being most affected. Effective asthma surveillance, which can serve to answer some of these questions, can also help us better target our research and prevention efforts, and track whether our interventions are working.

Because at least certain segments of the New England population appear to be disproportionately affected by asthma, ARC believes that it is especially urgent to develop a fast-track public health agenda focused on unlocking the mystery of asthma, investigating the root causes of this disease, identifying asthma clusters, and recommending ways to better prevent and control it. A more comprehensive asthma agenda must include:

- Creating more sophisticated and coordinated asthma surveillance systems that can track prevalence across state boundaries. Common definitions and reporting of asthma must be encouraged, and consistent data must be collected that can be analyzed on both large and small geographical levels.

- Studying connections between asthma prevalence and environmental factors.
- Directing research dollars to finding the root causes of asthma and its associated triggers.

The Trust for America's Health issued a report¹⁰ in July 2001 that concludes "*Given the strong link between asthma and environmental factors, health officials and medical experts agree that tracking asthma's prevalence in communities across America ... is critical to fighting its wildfire spread.... Additionally, the Trust found that "...state officials know and are willing to do what it takes to step up the fight against asthma. They simply lack the resources. For years, the national, state, and local health agencies have been poorly funded relative to the challenges they face..."*

Fortunately, this state of affairs is beginning to change. In 2002, CDC received for the first time a \$17.5 million appropriation to establish a national environmental public health tracking system, and additional funds were appropriated in 2003. Four of the six New England states were awarded grants from the 2002 appropriation to either implement or plan surveillance systems that collect data on chronic diseases and environmental exposures. ARC is working with all of the New England states to determine how best to coordinate these funds to achieve a regional environmental health tracking system that collects and analyzes comparable health and environmental data with respect to asthma.

As part of this effort to plan and build integrated health and environmental surveillance systems, ARC and the New England states are also striving to improve basic health surveillance on asthma in a number of ways. In addition to this unique regional BRFSS child asthma report, the New England states have been among the leaders in the nation in using and evaluating school-based surveillance information to better understand the full scope of who has pediatric asthma, where they live and where they go to school. The New England states are also working to better understand the surveillance value of information from the Medicaid and health insurance databases. ARC's commitment is to support the states in these varied and robust approaches to improved health surveillance, with the goal of creating reliable and comparable health data which can be analyzed in conjunction with environmental data to offer the most complete picture of asthma yet. Our ultimate goal is to understand the causes of asthma so that we can more effectively reduce the severity of the problem as well as the numbers of adults and children who are afflicted with the disease.

APPENDIX

The 2001 BRFSS data for each state, containing results for the state added questions, were obtained from the state BRFSS Coordinators listed in the Acknowledgments. Total sample sizes ranged from 2,420 in Maine to 7,752 in Connecticut. The sample included 821 households with children in Maine, 1,555 in NH, 1,551 in RI, 1,589 in VT, 2,160 in MA, and 2,903 in CT, for a total of 10,579. Because only 37% of BRFSS households contained children, selected demographics of these households compared with all New England households are shown in Table A. Not all respondents in Massachusetts were asked the childhood asthma questions so the total sample size noted in Table A is less than the total for adults reported in Part I. The sub-sample of households with children over-represents minority households and those with respondents age 25-44. Because the adult respondent was reporting on other members of the household, the sample weights provided by CDC that permit generalizing results to the entire adult population were not used. Instead, a household weight was created that was based on the probability of selection of the household, rather than the adult. This household weight included an adjustment for the number of residential telephones, to account for different probabilities of selection, but did not include the usual adjustment for the number of adults in each household, because that did not affect the probability for the *household*. Results were further adjusted to represent the total number of households in each state (instead of the total number of adults), based on data from the 2000 census (www.census.gov). All analyses were conducted using STATA software which takes into account the complex sample design of the BRFSS. A regional rate for New England was determined by combining the data for the six states, with STATA treating each state as a stratum in the sample design. In order to estimate how many children in New England currently had asthma, a method of extrapolation was used to generate a figure for Rhode Island (RI), which lacked information on children who “still had it.” In the other five states, a weighted average of 70.9% (95% CI 68.1-73.6) of children who had ever been told they had asthma were reported to still have it. Extrapolating for RI using the 70.9% figure, an estimated 7.6% of children in that state still had asthma. This rate was then used to estimate a current childhood asthma rate of 8.7% for the New England region. The current asthma rate for the five New England states, excluding Rhode Island, was also 8.7%. The estimated number of children affected by asthma in each state was obtained by multiplying the percent of children who were ever told or who currently had asthma, by the number of children in each state according to the 2000 census. Statistical significance was determined by non-overlapping 95% confidence intervals.

Table A.
Demographics of New England Households
2001 Behavioral Risk Factor Surveillance System
(n=28,380)

Group	Percentage (Confidence interval) *	
	All New England Households	New England Households with Children
Respondent Age (years)		
18-24	7.2 (6.8-7.6)	6.9 (6.3-7.5)
25-34	18.7 (18.1-19.3)	26.1 (25.0-27.2)
35-44	23.4 (22.7-24.0)	43.3 (42.1-44.6)
45-54	19.2 (18.6-19.8)	19.5 (18.5-20.5)
55-64	12.8 (12.4-13.3)	2.8 (2.5-3.3)
65+	18.7 (18.2-19.3)	1.4 (1.1-1.7)
Respondent Race/ethnicity		
White	85.4 (84.9-85.9)	80.5 (79.5-81.5)
Black	3.5 (3.2-3.8)	4.7 (4.3-5.3)
Hispanic	6.0 (5.7-6.4)	9.0 (8.3-9.7)
Other	5.1 (4.8-5.5)	5.8 (5.2-6.4)
*Percentages are from the weighted BRFSS data that were adjusted to represent households rather than respondents.		

NEW ENGLAND CHILDHOOD ASTHMA QUESTIONS:

CT, ME, MA, NH, and VT Questions:

NE1_1 Earlier you said that there were [Number from 13.6] children age 17 or younger living in your household. How many of these children have ever been diagnosed with asthma?
(590)

Number of Children	
Don't know/Not sure	<u>7 7</u>
Refused	9 9

[IF NE1_1 > 1THEN]

NE1_2 How many of these children still have asthma?

(592)

Number of Children	
Don't know/Not sure	<u>7 7</u>
Refused	9 9

[IF NE1_1 < 1THEN]

NE1_2 Does this child still have asthma?

(594)

Yes	1
No	2
Don't know/Not sure	7
Refused	9

RI Questions:

RI10_15. **If Q13.6 >1 ask:** You said before that there are **{Insert total number of children from Q13.6}** children under age 18 living in your household. Has a doctor ever said that any of the children under age 18 currently living in your household has asthma?

If Q13.6=1 ask: You said before that there is one child under age 18 living in your household. Has a doctor ever said that the child under age 18 currently living in your household has asthma? (482)

Yes	1
No Go to State-Added Lyme Disease	2
Don't know/Not sure Go to State-Added Lyme Disease	7
Refused Go to State-Added Lyme Disease	9

RI10_15a **If Q13.6 >1 and RI10_15=1 ask:** How many of these children have ever been diagnosed with asthma? (483-484)

Record Number	—
Don't Know	77
Refused	99

If RI10_15a=1, Go to RI10_17

RI10_16. How many of these children still have asthma? (485-486)

Record Number	—
None	88
Don't Know	77
Refused	99

RI10_17. Does this child still have asthma? (487)

Yes	1
No	2
Don't know/Not sure	7
Refused	9

REFERENCES

- ¹ Weiss KB, Sullivan SD. The health economics of asthma and rhinitis: assessing the economic impact. *J Allergy Clin Immunol* 2001; 107:3-8.
- ² American Lung Association. www.lungusa.org/asthma/ascpedfac99.html Accessed November 5, 2003.
- ³ www.cdc.gov/brfss for additional information about the survey.
- ⁴ New England Asthma Regional Council *Asthma in New England Part I. Adults*. Dorchester, MA, May 2003.
- ⁵ Adams, ML. Unpublished results from 2001 BBRFSS data for the six New England states for adults who reported ever having been told they had asthma. For methods, see reference 4.
- ⁶ US Bureau of the Census, 2001 figures from the Current Population Survey: www.census.gov/hhes/income/income01/statemhi.html. Accessed July 14, 2003.
- ⁷ Blackwell DL, Tonthat L. Summary Health Statistics for U.S. Children: National Health Interview Survey 1998. National Center for Health Statistics. *Vital Health Stat* 10(208). 2002.
- ⁸ Blackwell DL, Vickerie JL, Wondimu EA. Summary health statistics for US children: National Health Interview Survey, 2000. National Center for Health Statistics. *Vital Health Stat* 10 (213). 2003.
- ⁹ Nelson DE, Holtzman D, Bolen J, Stanwyck CA, Mack, K. Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS). *Int J Public Health* 2001;46: 1-42.
- ¹⁰ Trust for America's Health. *Short of Breath*. 1991: http://www.pewtrusts.com/pdf/hhs_tfa_short_of_breath.pdf