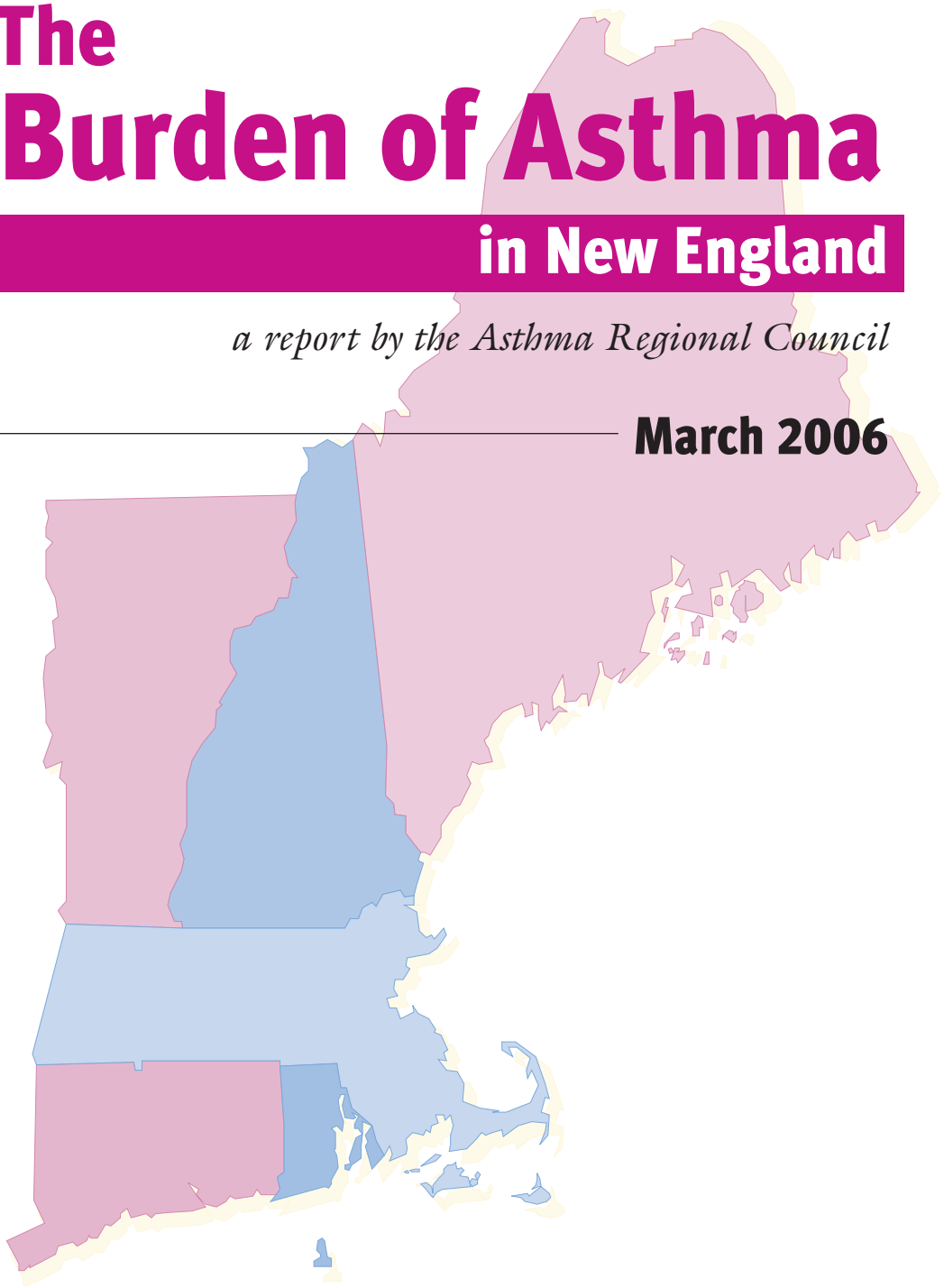
ARC

The Burden of Asthma in New England

a report by the Asthma Regional Council

March 2006



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A Report by the

Asthma Regional Council (ARC)

A program of The Medical Foundation

March 2006

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On Target Health Data LLC Suffield, CT.

ARC's mission is:

"To reduce the impact of asthma across New England through collaborations of health, housing, education, and environmental organizations, with particular focus on the contribution of schools, homes, and communities to the disease and with attention to its disproportionate impact on populations at greatest risk."

The recommendations provided by the following state health department staff are also acknowledged:

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

www.asthmaregionalcouncil.org

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Executive Summary

This report represents the most current and comprehensive investigation of asthma prevalence conducted in the New England (NE) region. It examines the health, socioeconomic, behavioral, and environmental predictors that relate to adult and child asthma in the six states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont). It was produced by the New England Asthma Regional Council (ARC), a coalition of public agencies, private organizations and researchers working together to address the environmental contributors to asthma (www.asthmaregionalcouncil.org). This report, which follows an earlier study conducted by ARC on 2001 asthma rates, uses data obtained from both the 2003 National Survey of Children's Health (n=12,026) and the 2004 Behavioral Risk Factor Surveillance System (BRFSS; n=33,618) providing a richer, more comprehensive picture of the disease as it manifests itself amongst both children and adults in the region.

Asthma is a chronic and potentially serious respiratory disease that, if not treated, can cause permanent lung damage, disability and even death. The airways become constricted through swelling and excessive mucous production, making it difficult to breathe. In 2003, asthma had affected nearly 30 million Americans in their lifetime, according to the National Center for Health Statistics. The disease costs the U.S. economy about $16 billion each year in direct medical care and lost productivity.[1] In 2002, asthma accounted for more than 12.7 million physician office visits, 1.9 million emergency department visits, nearly 500,000 hospitalizations, and over 4,000 deaths in the United States.[2]

Results presented in this report indicate that asthma rates in New England (NE) remain consistently higher for both adults and children than in the rest of the country. Current asthma rates for New England children ages 13-17 and for adults ages 18-34 and 35-54 (which are the bulk of asthma cases) were significantly higher than comparable rates in the rest of the US. *Approximately 14% of NE children and 15 % of NE adults have been diagnosed with asthma in their lifetimes, representing an estimated 1.62 million adults and 475,000 children. Nearly ten percent of NE children and adults currently had asthma in 2004, representing an estimated one million adults and 330,000 children.* Current and lifetime asthma rates were statistically similar in all six NE states for both adults and children, and were highest among older children, younger adults, the obese of all ages, and those with lower incomes. However the disease afflicts people of all socio-economic and racial backgrounds.

Among adults, the prevalence of both lifetime and current asthma in NE increased significantly between 2001 (when ARC conducted its last analysis) and 2004. However the lifetime rates increased both for men and women, while the current rates increased only in women, while current rates for men remained virtually unchanged. Direct comparisons of childhood asthma rates were not made because the survey methods differed in 2001 and 2004; however, estimates of the numbers of New England children affected by current asthma increased from 288,100 in 2001 to 330,000 in 2004.

Childhood asthma rates were higher among boys, while adult asthma rates were higher among women. Persons with asthma were consistently more likely than persons without asthma to be in poorer physical and mental health, more limited in activities, to report a perceived environmental illness (adults), and have poorer school attendance (children). For both children and adults with asthma, the reported impact of asthma was greatest on Blacks and/or Hispanics and those with lower incomes.

Summary of Asthma Prevalence Rates

New England and US, 2001 and 2003-2004

	2001*		2003-2004**	
Measure	**New England**	**Rest of US**	**New England**	**Rest of US**
	Percent	Percent	Percent	Percent
Children				
Lifetime asthma	12.3	NA	13.9	12.4
Current asthma	8.7	NA	9.6	8.8
Adults				
Lifetime asthma	12.7	NA	15.0	13.0
Current asthma	8.9	7.1	9.7	8.0
*ARC reports Asthma in New England Part I & II. ** 2004 BRFSS for adults and National Survey of Children's Health 2003 for children.				

Other report highlights:

Current Asthma in Children:

- Among New England children, asthma rates were higher among boys (11.4 vs. 7.7% for girls), older children (11.8% for 13-17 year olds vs. 5.1% for those younger than 5), Hispanics (14.6% vs. 9.1% for whites), and children who lived in a single parent household with their mothers only (13.9% vs. 8.3% for two-parent households), and obese children (13.4% vs. 9.7% for non-obese children).

- There was a highly significant association between income level and asthma, with asthma rates more than doubling between those in the highest and lowest income categories. Asthma rates increased from 7.6% for those at or above 300% of the poverty level, to 15.6% among children in households below 100% of the poverty level.

- One third (35.4%) of children with asthma were reported to have had "moderate to severe health difficulties" as a result of their asthma. In addition, 10% were in fair or poor health, 15.3% were limited in their ability to do things other children their age do, and 4.6% were often depressed. All three of these latter rates were significantly higher than for children without asthma.

- For 15.9% of children with current asthma, a "medium to great deal" of a burden was reported to be placed on the family.

- One in twenty (5.5%) children with asthma was hospitalized overnight for their asthma and 32.8% visited a hospital Emergency Room in the past year.

- The burden of asthma on children, families, and in terms of health care utilization, as assessed by these measures, was similar across all six states but was consistently greater among lower income and non-Hispanic Black and/or Hispanic children.

Current Asthma in Adults:

- Among New England adults, asthma rates were similar in all six states, but were higher among women (12.5% vs. 7.1% for men), younger adults (12.5% for 18-24 year olds), and adults with household income below $25,000 (12.8%). There were no differences in current adult asthma rates by race or ethnicity.

- Asthma rates were significantly higher among adults who were obese (13.1% vs. 8.7% for those not overweight or obese).

- Asthma rates were significantly higher among those who currently smoked (11.2% vs. 9.3% for non-smokers).

- Among New England adults with current asthma, 22.5% were in fair or poor health, 17.2% reported 14 or more days of poor mental health in the past month, 30.7% reported activity limitations, and 8.6% were unable to work. All of these measures were significantly higher than for non-asthmatic adults.

- Adults with asthma were also more likely than adults without asthma to report no leisure time exercise in the past month (25.1% vs. 19.4% for non-asthmatics).

- Among adults with asthma, the burden as assessed by various measures of well-being was similar for all New England states but was generally greatest among lower income and minority adults.

- Adults with current asthma were over 2.5 times more likely than those without asthma to report a perceived illness (not necessarily asthma or asthma-related) from an indoor air exposure in the past 12 months (48.8% vs. 17.6%) and nearly four times as likely to perceive being ill from outdoor air pollution (27.6% vs. 7.0%).

The following report includes a more complete presentation of the findings from both surveys, along with recommendations by the Asthma Regional Council. The report also discusses the limitations of the surveys and data analysis issues, and the effect of small sample sizes.

I. Introduction

Asthma is a chronic and potentially serious respiratory disease that, if not treated, can cause permanent lung damage, disability, and even death. The airways become constricted when exposed to triggers such as allergens, viral infections and pollution, making it difficult to breathe. In 2003, nearly 30 million Americans had been diagnosed with asthma during their lifetime, according to the National Center for Health Statistics. The disease costs the U.S. economy about $16 billion each year in direct medical care costs and lost productivity.[1] In 2002, asthma accounted for 12.7 million physician office visits, 1.9 million emergency department visits, and nearly 500,000 hospitalizations in the United States.[2]

Several studies have reported large increases in the prevalence[3,4,5] and/or the burden[3,4] of asthma since 1980. One study found a 75% increase in the self-reported asthma prevalence rate between 1980 and 1994 in all race, sex, and age groups in every region of the country,[2] while others found increases in hospitalizations[4] and costs associated with the disease.[6] Some recent studies have suggested that the prevalence and burden of asthma may have leveled off,[2,3,4,7,8] at least in some parts of the world. Such findings have been inconsistent and serve to illustrate the importance of continued monitoring of the disease. The role of environmental influences in any stabilization of the disease may be a key factor and crucial to the understanding of trends.

The Asthma Regional Council of New England (ARC) has been tracking asthma rates in the region as part of its mission to improve the lives of those living with the disease. In 2003 and early 2004, ARC issued a two-part report on Asthma in New England that described the status of asthma among children and adults in the region in 2001.[9,10] That report indicated that in New England an estimated 941,000 adults and 288,000 children currently had asthma in 2001, or approximately 9% of all adults and children. Over 12% had reported receiving a diagnosis of asthma sometime in their lives (lifetime asthma). Data limitations at that time precluded analysis of the burden of asthma, especially among children, and did not include any information on environmental factors that might influence the disease. This current report seeks to address some of those limitations, using more comprehensive data that are now available. In addition, this report updates the prevalence estimates to 2003-2004 and compares New England (NE) rates with the rest of the United States.

Child data were reported by the adult who knew the most about the randomly selected child's health in the 2003 National Survey of Children's Health, and adult data were reported by a randomly selected adult on the 2004 Behavioral Risk Factor Surveillance System (BRFSS). Both surveys were conducted by telephone and used random digit dialing techniques. Results include 12,026 New England children surveyed in 2003-04 and 33,618 adults surveyed in 2004. Only the adult results from the BRFSS can be compared with the adult results in ARC's previous report because the surveys used for the child data differed.

Guide to Reading This Report

To assist in understanding some basic concepts and new terms that are introduced in this report, a brief glossary is included in the box below. These terms include measures to describe the "burden" of asthma, which are often not intuitive, and the new concept on the adult survey of "perceived environmental illness or symptoms". Often the terms were not well defined for the survey respondents and/or require more explanation than is possible in the charts and text. A more complete list of terms is included in the Glossary on page 41.

Lifetime asthma: A doctor or other health professional has ever said the child/adult had asthma.
Current asthma: Child/adult still has asthma (as reported by adult respondent for child).
Moderate-severe difficulties: Adult reported that asthma causes moderate to severe difficulties to child (not defined on survey).
Family burden: Respondent reports that a medium to great deal of a burden is placed on the family due to child's asthma (burden was not clarified on survey).
Harder to care for: Respondent reports feeling that, in the past month, child with asthma was "usually" or "always" much harder to care for than most children his or her age.
Greater sacrifice: Respondent (referencing child with asthma) said that in past month, they usually or always felt they were giving up more of their life to meet child's needs than ever expected.
Perceived illness from indoor air: Adult reported an illness or symptoms (not necessarily asthma) in the past 12 months that they thought was caused by something in the air inside a home, office, or other building.
Perceived illness from air pollution: Adult reported an illness or symptoms (not necessarily asthma) in the past 12 months that they thought was caused by something in the air outdoors.

A key concept in statistics, and one that allows us to understand whether there are significant differences between groups, is the Confidence Interval (CI), presented in Supplemental Tables on pages 41-76. Since all values in these surveys are estimates, the 95% CI is the range of values within which the "true" value probably lays 95% of the time. When two groups had 95% confidence intervals that overlapped, indicating that the "true" value could potentially be the same in both groups, the groups were conservatively assumed to have statistically similar rates, even when the P value was <0.05 indicating statistical significance. **The use of "more likely" or "higher than" in the report indicate these results were significantly different based on this criterion.** (The only exception is in discussing disparities among children with asthma, which is noted in that section). Statistical tests greatly depend on the sample size, so sometimes two rates may look like they should be significantly different, when they are not. This is especially likely to occur when making comparisons among race and ethnic groups because of the small number of non-white respondents surveyed. Indeed, the numbers for other than whites, non-Hispanic Blacks and Hispanics were so small that they had to be grouped together into one category called "Other". Thus, when we refer to "minorities" in this report, we are referring to non-Hispanic Blacks and Hispanics. While the ethnic backgrounds of these Hispanics were not ascertained, census data show that many Hispanics in New England are of Puerto Rican descent.

Statistical significance only indicates that an association exists between two (or more) factors, but does not provide any information about cause or effect and does not automatically take other factors into consideration. As an example, many results show differences by age and income, and age and income also vary among different racial and ethnic groups. So when results vary for different race and ethnicity groups, we are unable to say whether it is due solely to race/ethnicity or if results are "confounded" by other factors such as differences in age or income between the groups.

II. Results:

A. New England Children

1. Asthma Prevalence (2003-04)

Highlights:

- Nearly 14% of all New England children had ever been told they had asthma, and nearly 10% currently had asthma.
- Current asthma rates were higher among boys, older children, Hispanics, children in low-income households, obese children, and those living with their mothers only.

Nearly one in every seven New England children (13.9%) were reported to have lifetime asthma (a doctor or other health professional has ever said the child had asthma) and one in every ten (9.6%) were reported to currently have asthma (Figure 1). Thus about 30% of children with lifetime asthma were no longer reported to have it.

The number of NE children affected by asthma was estimated to be 475,000 for lifetime asthma and 330,000 for current asthma based on 2004 population estimates from the US Census. Results for both lifetime and current asthma were statistically similar in all six New England states (Figure 1). Results by demographic groups were also similar for the two asthma measures and are presented in Supplemental Tables 1 and 2 (pages 41-44). Because many of the survey questions about asthma were only asked about children with current asthma, that measure will be used in this section to describe the disease in more detail, unless otherwise noted.

Current childhood asthma rates were nearly 50% higher among boys compared with girls (11.4% vs. 7.7%; Figure 2). Both current and lifetime asthma rates were also higher among older children (Figure 3). Although childhood asthma rates were highest among Hispanic and Black children, the excess reached statistical significance only between Hispanic children and non-Hispanic whites (Figure 4).

Asthma rates were highly associated with household income, as measured by poverty status. Highest rates were among children in households below 100% of the poverty level (15.6%), and lowest rates were among children in the majority of households reporting incomes above 300% of the poverty level (7.6%; Figure 5). *Thus asthma rates for the lowest income group were more than twice as high as those in the highest income group*. Family structure (Figure 6) and the number of adults in the household (Supplemental Tables only) had similar affects on child asthma rates, with highest rates reported in households with only one adult and where there was a single parent, the mother.

Both lifetime and current asthma rates were associated with body weight, with a significant difference shown between the obese and those that were not obese (Figure 7; those with unknown weight status were omitted). Current asthma rates were also significantly higher among children in households in which there was reported to be a cigarette, pipe or cigar smoker (13.0% vs. 9.0% for households without a smoker; Figure 8).

Figure 1. Asthma Regional Council

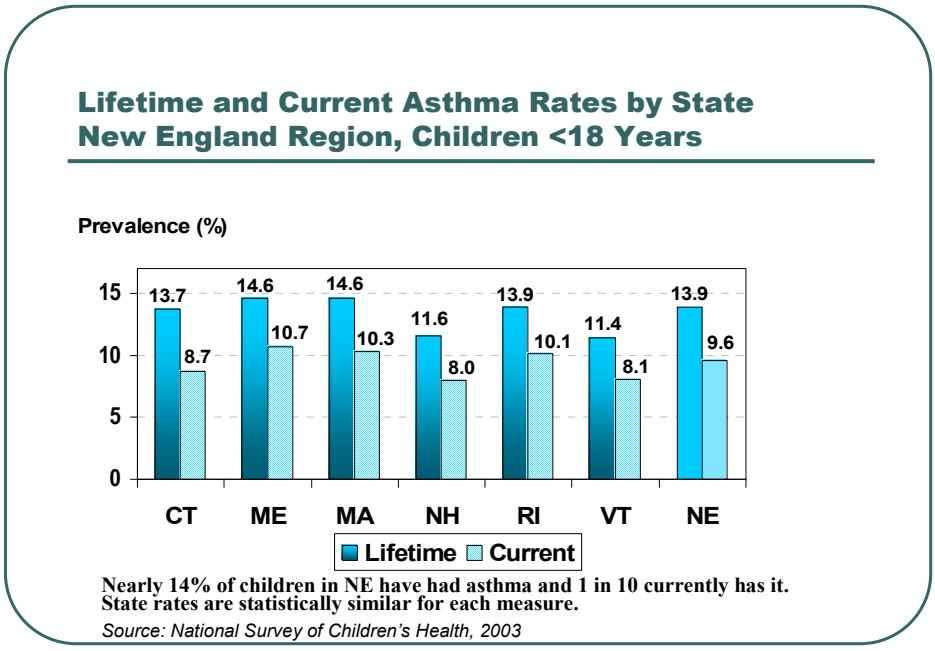


Figure 2. Asthma Regional Council

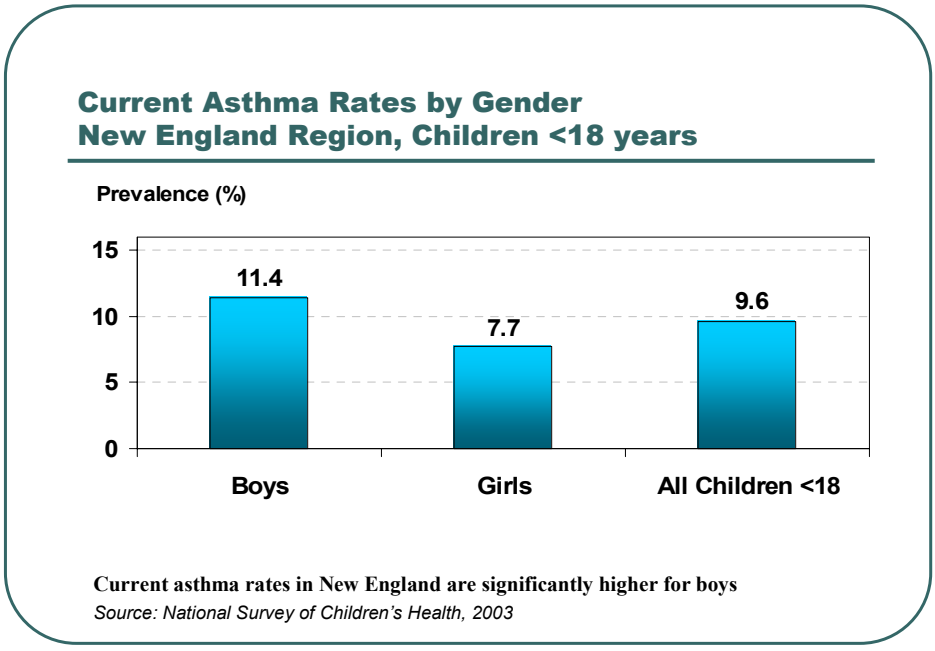


Figure 3. Asthma Regional Council

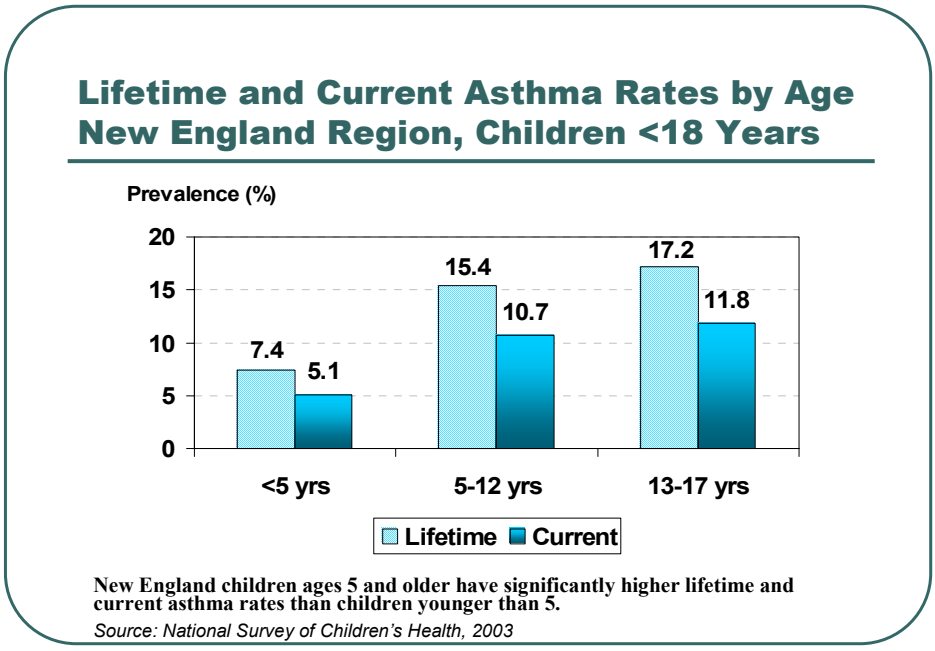


Figure 4. Asthma Regional Council

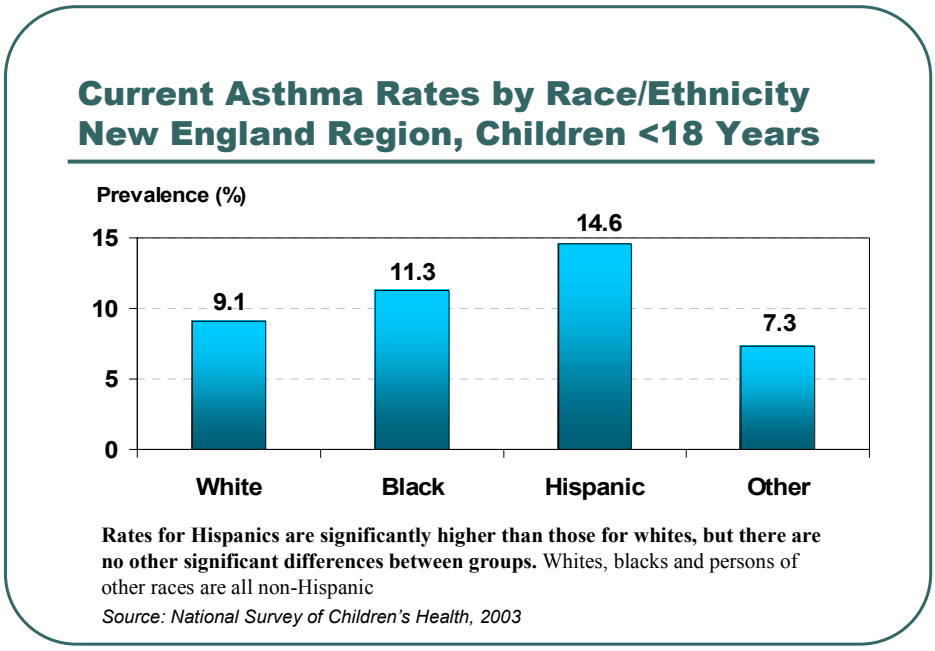


Figure 5. Asthma Regional Council

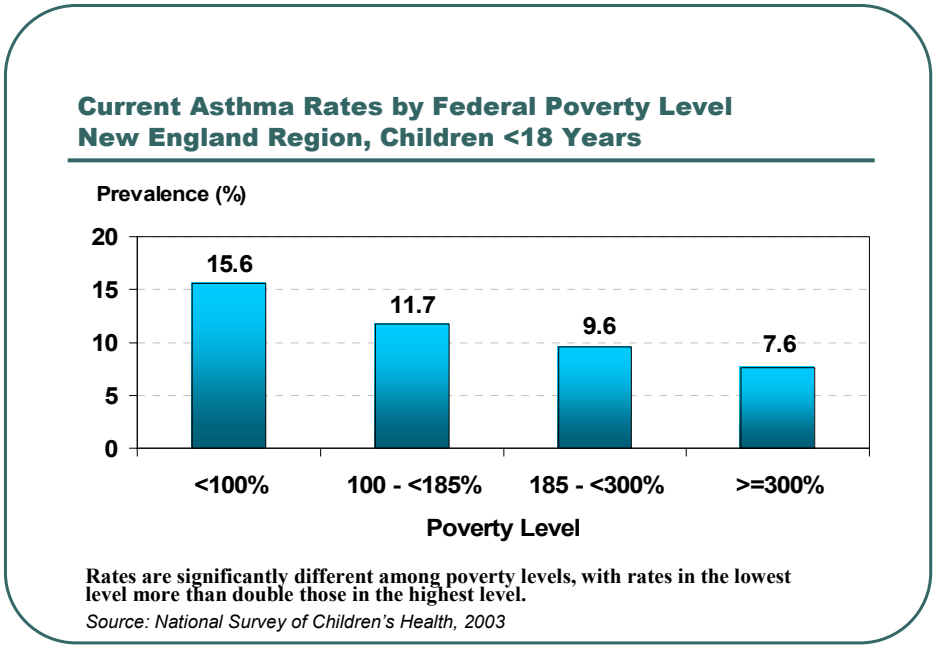


Figure 6. Asthma Regional Council

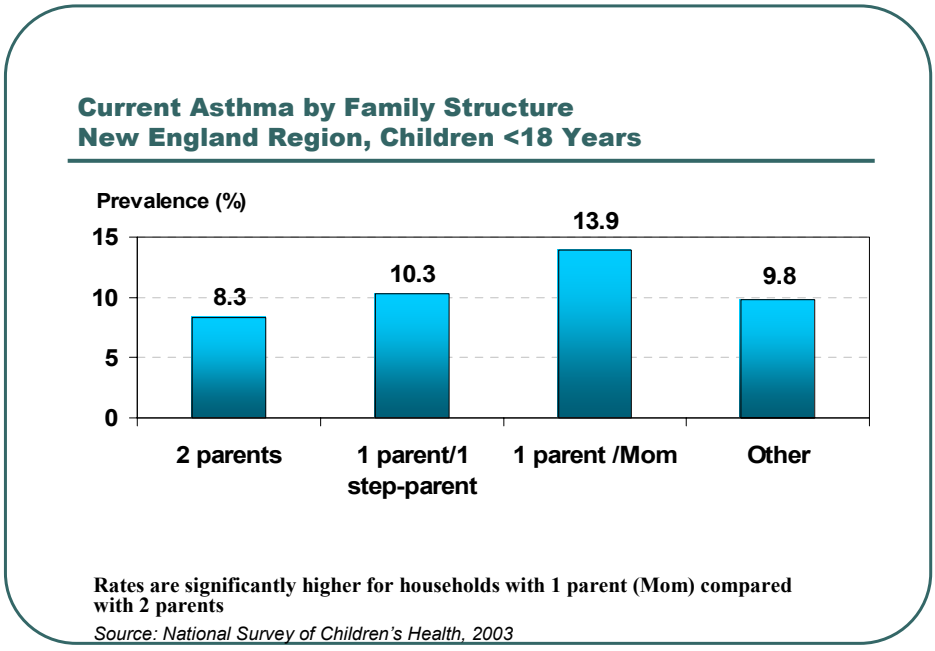


Figure 7. Asthma Regional Council

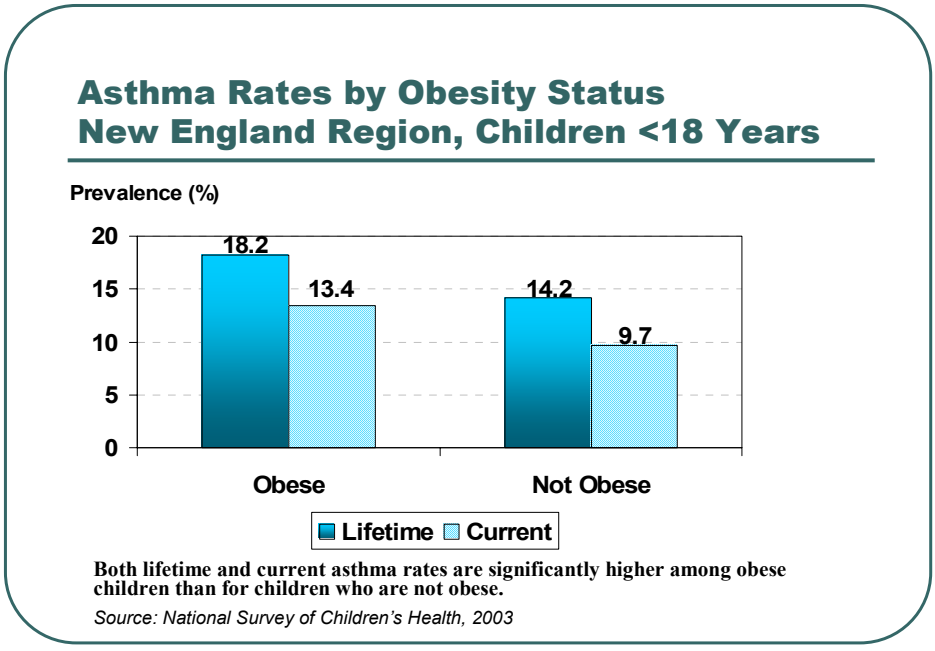
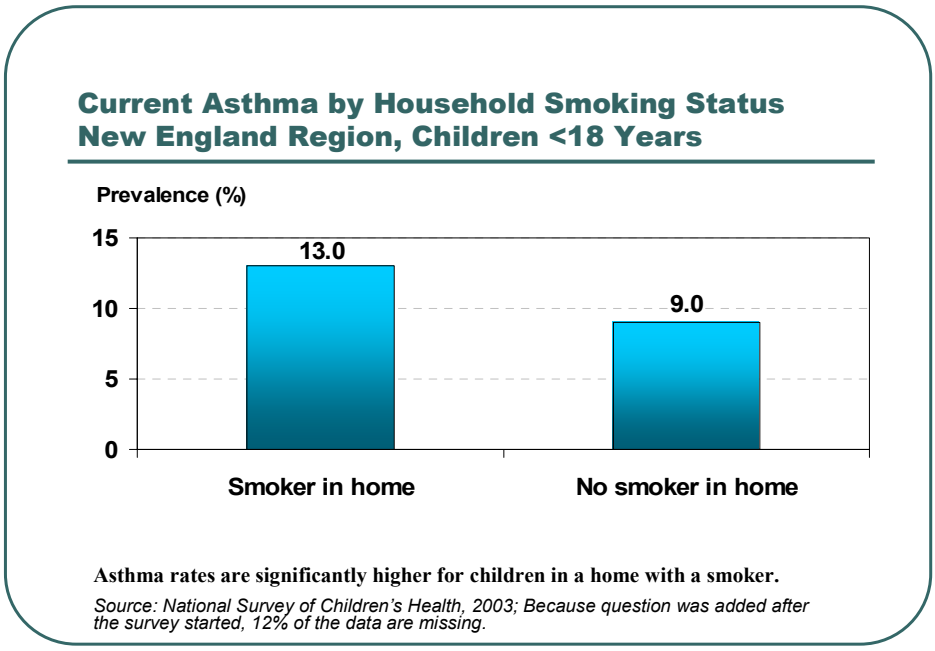


Figure 8. Asthma Regional Council



2. Burden Created by Asthma in New England Children

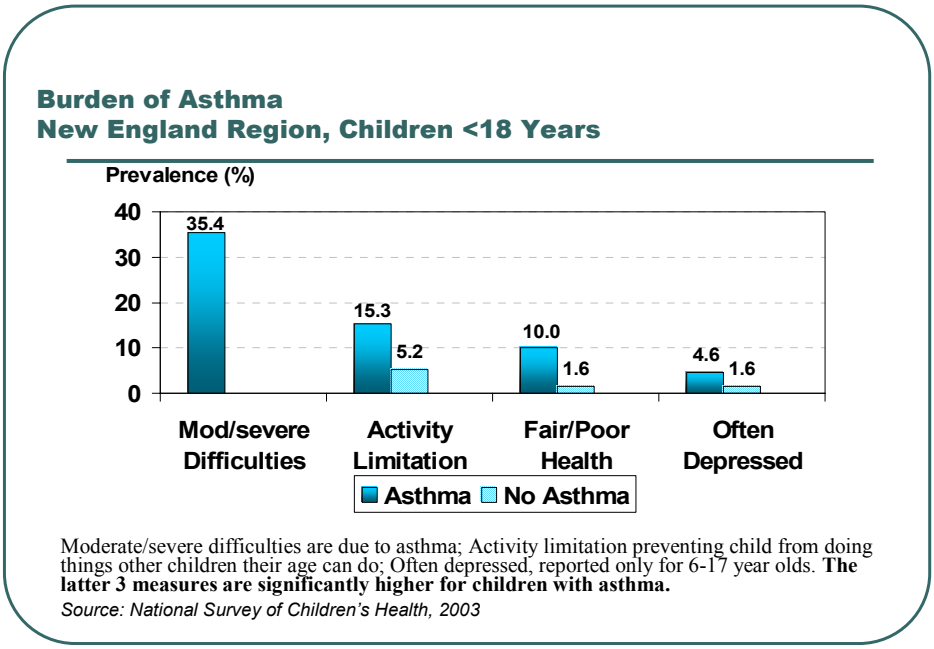
Highlights:

- Over one third of children with asthma were reported to have "moderate to severe" difficulties due to their asthma and 15% had an activity limitation that prevented them from doing things other children their age can do.
- Compared with non-asthmatic children, children with asthma were more likely to be in worse general health, be often depressed, and have more missed days of school in the past year.

Burden on child: About three in five New England children with current asthma (59.3%) had an asthma attack in the past 12 months (not further defined on survey) and 35.4% were reported to have "moderate to severe" (as opposed to minor) health difficulties as a result of their asthma (Figure 9), including 4.6% who were said to have "severe" difficulties.

Where possible, children with current asthma were compared with non-asthmatic children on a number of health-related measures (See Supplemental Table S-3, page 45). Of course, children without asthma could have other adverse health conditions, and indeed the survey indicated that 38.9% of these children did have some other health condition (e.g. vision and hearing problems, allergies, diabetes, attention deficit disorder, learning disabilities, autism, bone or joint problems, or other physical impairment). Thus, the comparison between children with asthma and those without asthma is not a comparison to completely healthy children. Children with current asthma were more likely than non-asthmatic children to be reported to have an activity limitation (15.3% vs. 5.2%), be in fair or poor health (10.0% vs. 1.6%) and to be depressed "usually or always" (4.6% vs. 1.6% and reported only for ages 6-17; Figure 9). The reported mean number of school days missed in the past year was also significantly higher among children with asthma (5.9 vs. 3.6; Figure 10).

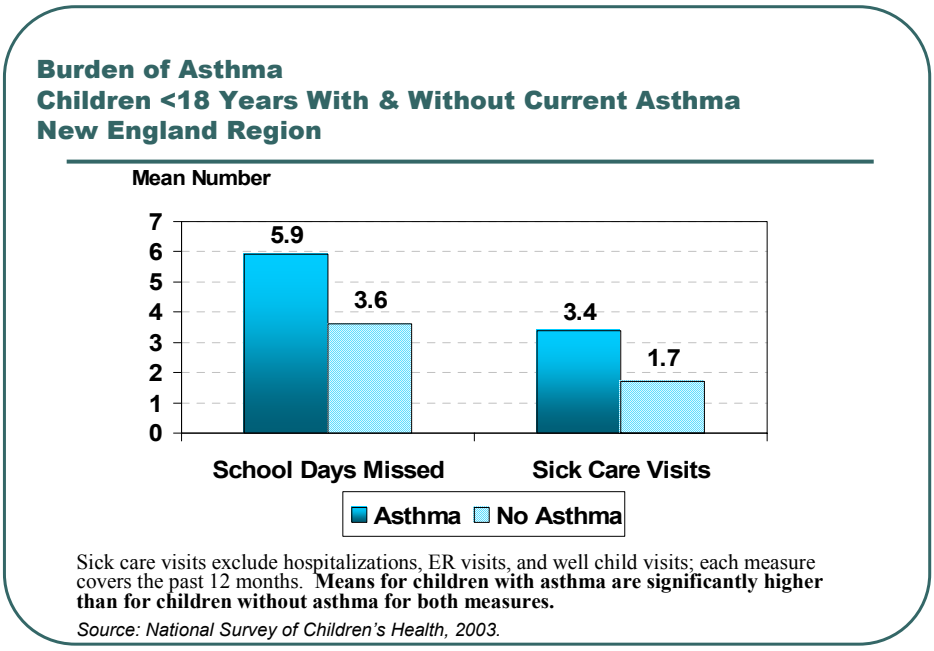
Figure 9. Asthma Regional Council



Moderate/severe difficulties are due to asthma; Activity limitation preventing child from doing things other children their age can do; Often depressed, reported only for 6-17 year olds. **The latter 3 measures are significantly higher for children with asthma.**

Source: National Survey of Children's Health, 2003

Figure 10. Asthma Regional Council



Sick care visits exclude hospitalizations, ER visits, and well child visits; each measure covers the past 12 months. **Means for children with asthma are significantly higher than for children without asthma for both measures.**

Source: National Survey of Children's Health, 2003.

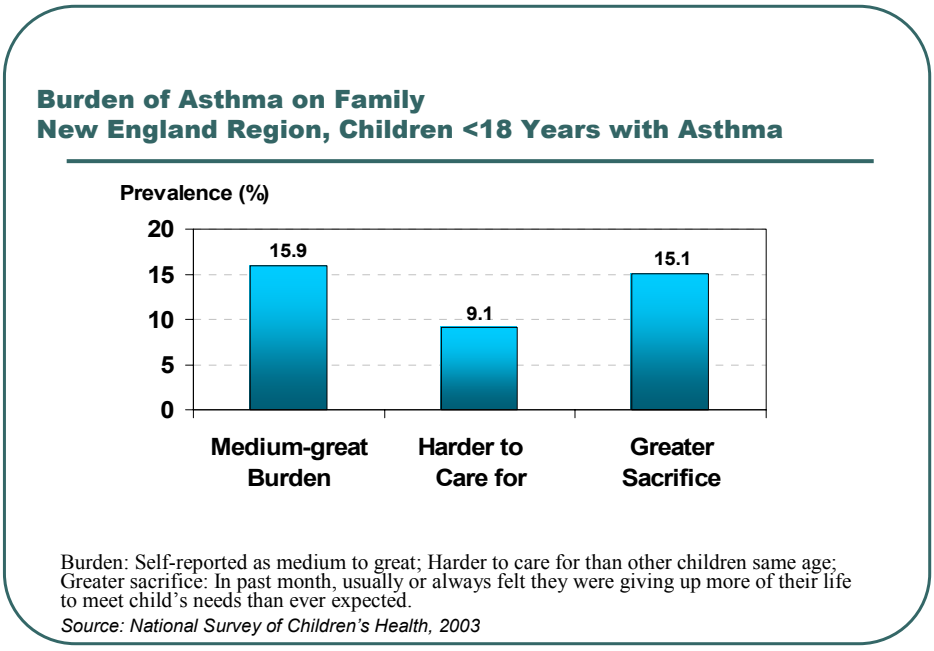
3. Burden of Asthma on New England Families and the Health Care System

Highlights:
- For nearly 16% of children with current asthma, a "medium to great" burden was reported to be placed on the family.
- Over 5% of children with asthma were hospitalized for asthma in the past year and nearly one third had visited a hospital Emergency Room (ER).

Burden on family: In addition to having an impact on the child with asthma, the disease also significantly affects the family. For 15.9% of New England children with asthma, a "medium to great" burden was reported to be placed on the family, although the type of burden was not ascertained. In addition, 9.1% of respondents felt that the child with asthma was "usually or always" much harder to care for in the past month than most children that age, and 15.1% said that in the past month, they "usually or always" felt they were giving up more of their life to meet the child's needs than ever expected (termed "greater sacrifice"; Figure 11). These questions were only asked about children with asthma so no comparisons could be made.

Burden in Terms of Health Care Utilization: Children with current asthma were significantly more likely than children without asthma to be reported to take prescription medications of any kind, excluding vitamins (78.9% vs. 15.3%), to have visited an emergency room (ER) for any reason in the past 12 months (32.8% vs. 17.8), and to need special services, equipment, or other care for their health that they cannot obtain from their personal doctor (21.0% vs. 10.9%; Supplemental Table S-3 and Figure 12). Over one in every twenty children with asthma (5.5%) were hospitalized for their asthma in the past year, and children with asthma were reported to have twice as many doctor visits for sick care in the past year as those without asthma (3.4 vs. 1.7; Figure 10). One in ten children with asthma (10.1%) was reported to need or receive special therapy, not including psychological therapy. Despite the clear need for medical care, and the demonstrated additional use of the health care system, 4.0% of children with asthma were reported to be uninsured and 7.0% had no regular doctor (data not shown).

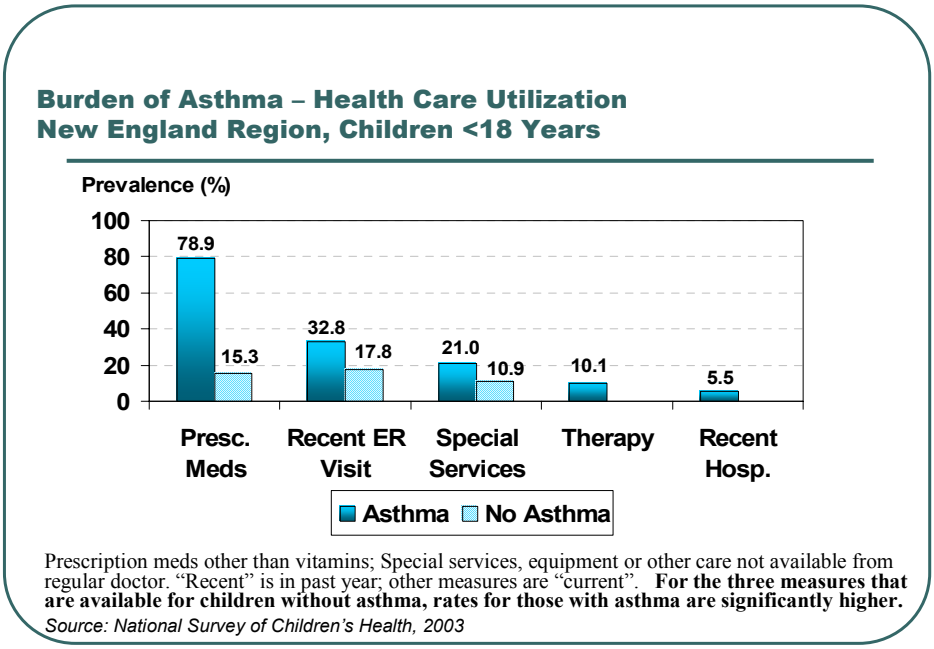
Figure 11. Asthma Regional Council



Burden: Self-reported as medium to great; Harder to care for than other children same age; Greater sacrifice: In past month, usually or always felt they were giving up more of their life to meet child's needs than ever expected.

Source: National Survey of Children's Health, 2003

Figure 12. Asthma Regional Council



Prescription meds other than vitamins; Special services, equipment or other care not available from regular doctor. "Recent" is in past year; other measures are "current". **For the three measures that are available for children without asthma, rates for those with asthma are significantly higher.**

Source: National Survey of Children's Health, 2003

4. Differential Burden of Childhood Asthma in New England

Highlights:
- Among children with asthma, the burden, as assessed by several selected measures, was reported to be greater for minority and low-income children.

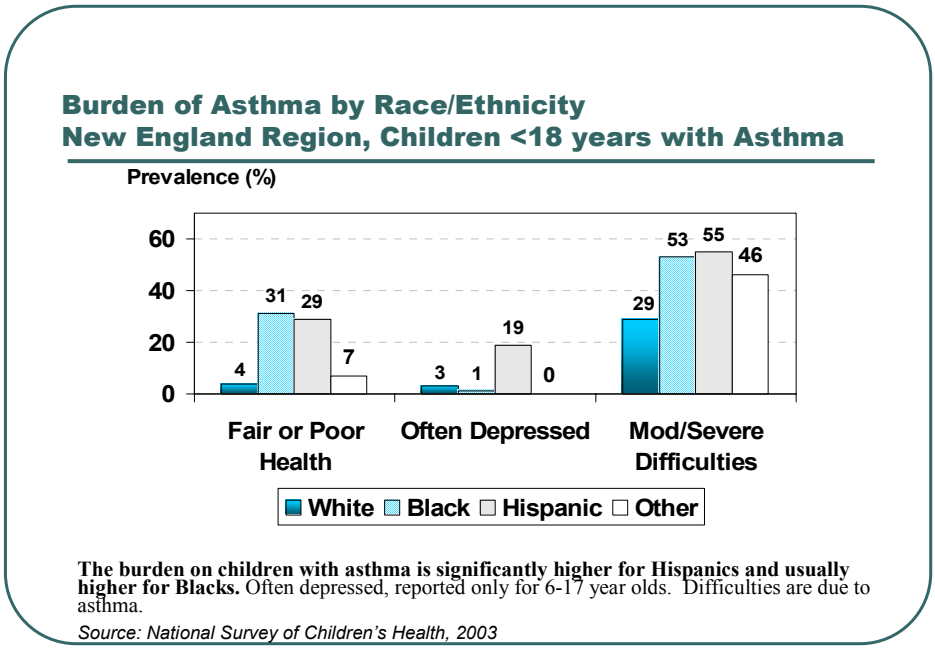
To examine the differential burden of asthma among the sampled 1,105 NE children with the disease, several measures of burden on the child, the family and on health care utilization were analyzed. See Supplemental Tables S-4 for complete list and definitions. Although some of these differences were not significant based on the criteria noted earlier (due to small sample sizes especially for Blacks) they are included here because they appear to be quite consistent.

None of the selected measures of burden was associated with state of residence or sex of the child. Only two of the measures showed significant disparities by age and these were both related to health care utilization: having any ER visits in the past year and hospitalizations for asthma in the past year. In both cases, rates were highest for children younger than age 5 (49% for ER visits and 21% for hospitalizations; Supplemental Tables).

Results by race/ethnicity showed several differences, with significant disparities often seen for Hispanics, while results for Black children did not always reach statistical significance. Compared with non-Hispanic white children, Hispanic and Black children with asthma were (or appeared) more likely to be reported to be in fair or poor health, and to have "moderate to severe" difficulties from their asthma. Frequent depression was reported most often for Hispanic children (Figure 13). The family burden for Hispanic and Black children was (or appeared) more likely to be "moderate to great," and "sacrifice" was reported more often (Supplemental Tables & Figure 14). Black children with asthma were significantly more likely than whites to have been hospitalized (Figure 14), although ER visits were similar for all race and ethnicity groups (Supplemental Tables).

Results by federal poverty level were the most likely to indicate significant disparities for the child, the family and for health care utilization. The lowest two poverty levels were combined into a "less than 185% of poverty" group because of the relatively small sample sizes. These poorest children with asthma were significantly more likely than those in the highest income group to be reported to be in fair or poor health, often depressed, to have activity limitations, and to have "moderate to severe" difficulties due to their asthma (Figure 15). Burden on the family by all three family burden measures was also reported to be greatest for the lowest poverty group (Figure 16). In addition, hospitalizations, ER visits, and the need for therapy were reported to be higher among the poorest children with asthma when compared with those at above 300% of poverty (Figure 17). Children with asthma in households below 185% of poverty level were also much more likely to not have a regular doctor, although health insurance rates were similar for all poverty levels (data not shown). In many cases, differences in burden were only significant between the highest and lowest federal poverty level groups, although in a few cases the burden for the lowest income group was also significantly greater than that for children in the middle (185% -300% of poverty) group; e.g., Figure 16).

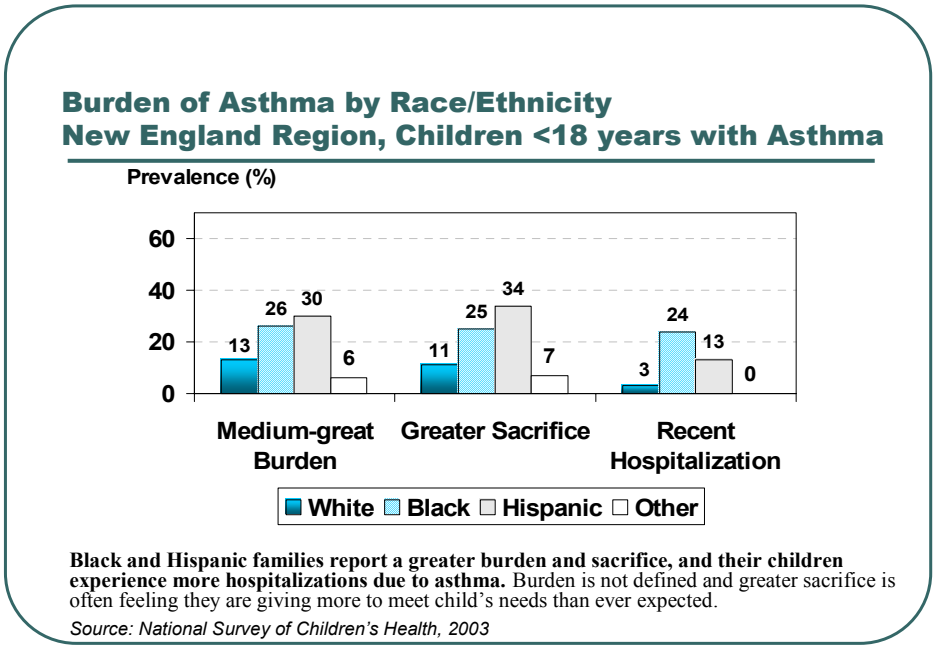
Figure 13. Asthma Regional Council



The burden on children with asthma is significantly higher for Hispanics and usually higher for Blacks. Often depressed, reported only for 6-17 year olds. Difficulties are due to asthma.

Source: National Survey of Children's Health, 2003

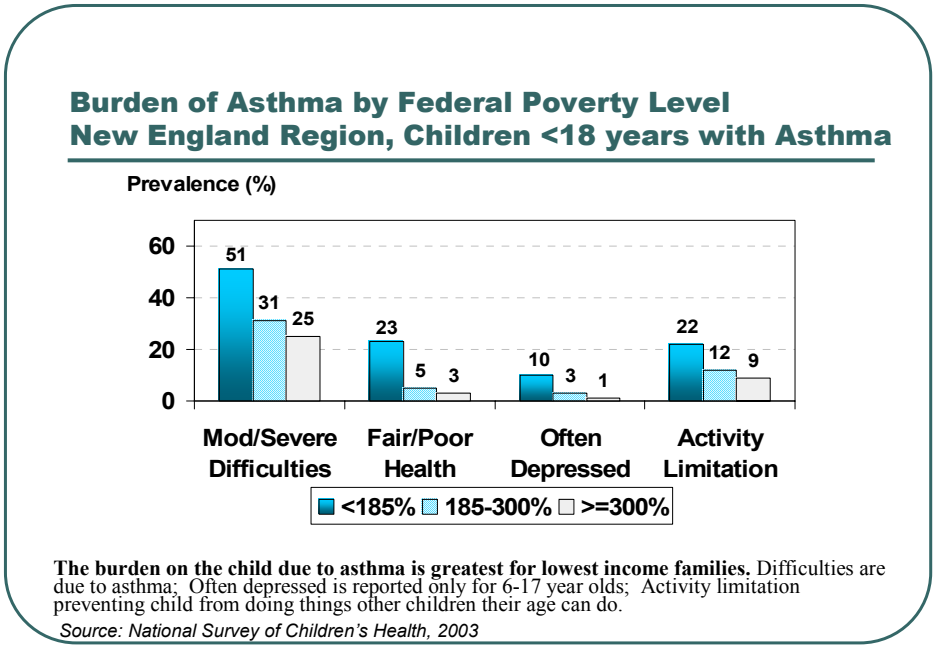
Figure 14. Asthma Regional Council



Black and Hispanic families report a greater burden and sacrifice, and their children experience more hospitalizations due to asthma. Burden is not defined and greater sacrifice is often feeling they are giving more to meet child's needs than ever expected.

Source: National Survey of Children's Health, 2003

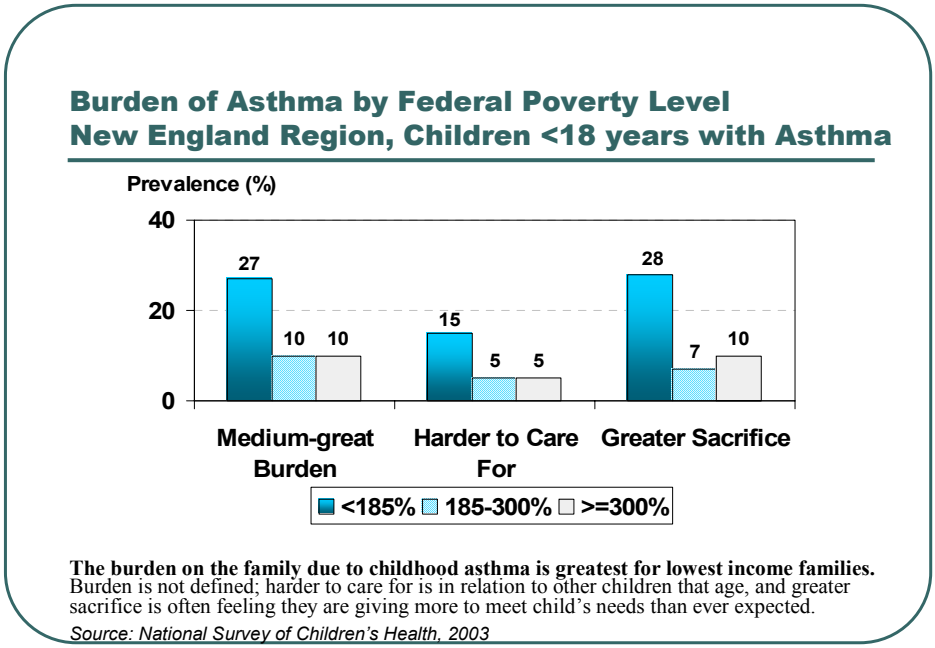
Figure 15. Asthma Regional Council



The burden on the child due to asthma is greatest for lowest income families. Difficulties are due to asthma; Often depressed is reported only for 6-17 year olds; Activity limitation preventing child from doing things other children their age can do.

Source: National Survey of Children's Health, 2003

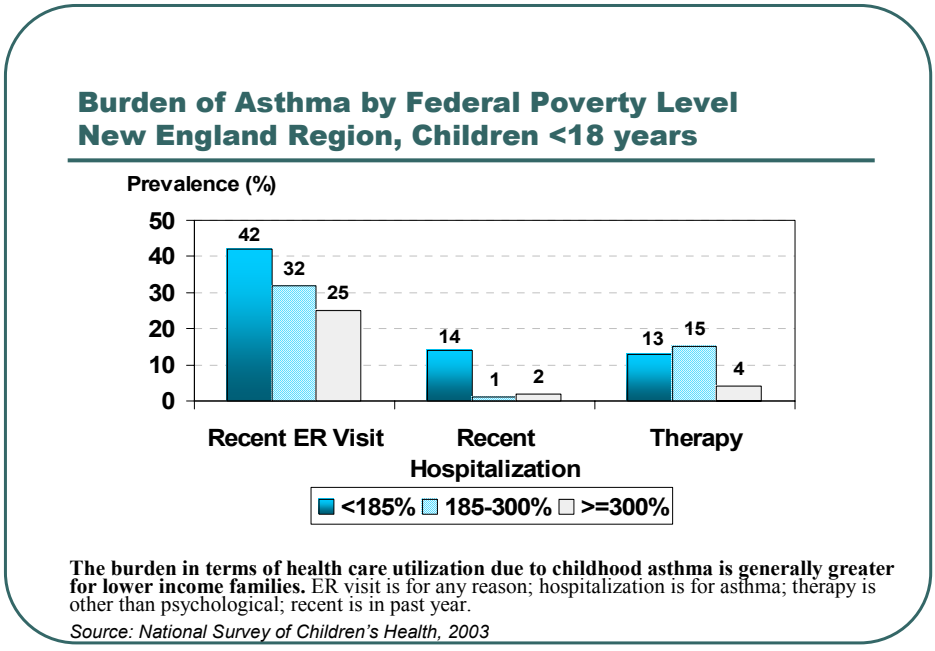
Figure 16. Asthma Regional Council



The burden on the family due to childhood asthma is greatest for lowest income families. Burden is not defined; harder to care for is in relation to other children that age, and greater sacrifice is often feeling they are giving more to meet child's needs than ever expected.

Source: National Survey of Children's Health, 2003

Figure 17. Asthma Regional Council



5. New England Children and the Rest of the US Compared

Highlights:
- Childhood asthma rates appear to be consistently higher in New England compared with other parts of the US, although differences were not always significant.

Lifetime Childhood Asthma: Lifetime childhood asthma rates were significantly different among the ten Health and Human Services (HHS) Regions. The rate for New England (Region I) at 13.9% was the highest rate among the regions. The lowest rate, or 9.4%, was found in Region VIII (Colorado, Montana, North and South Dakota, Utah and Wyoming). The rate in NE was significantly higher than the lifetime child asthma rate for all the other 44 states and the District of Columbia combined (13.9% vs. 12.4%; Figure 18).

Current Childhood Asthma: Current childhood asthma rates were also significantly associated with HHS Region. The New England (Region I) rate of 9.6% for current childhood asthma was the second highest among the ten regions, with rates ranging from 7.0% in Regions VIII and X (Alaska, Idaho, Oregon, and Washington) to 9.8% in Region VI (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas). Comparing New England with the other 44 states and DC combined, current childhood asthma rates among New England teenagers ages 13-17 were significantly higher than comparable rates for the rest of the US (11.8% vs. 9.6%; Figure 19.), although rates for other age groups and the overall rate were not significantly higher. Differences were also noted in the current childhood asthma prevalence rates for the lowest poverty levels (Figure 20), where New England rates were significantly higher than the rest of the US for those below 185% of poverty.

Figure 18. Asthma Regional Council

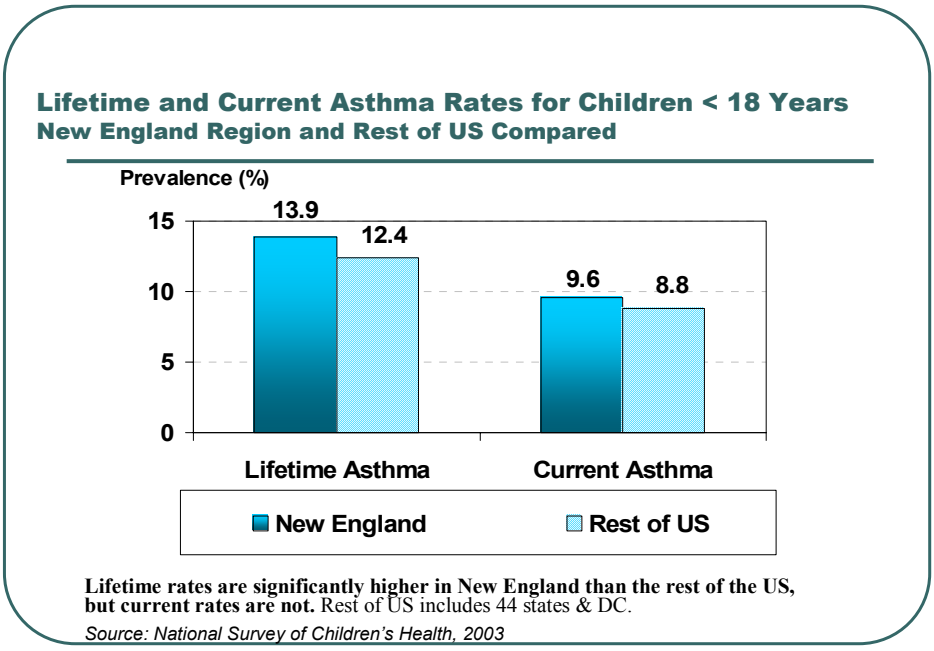


Figure 19. Asthma Regional Council

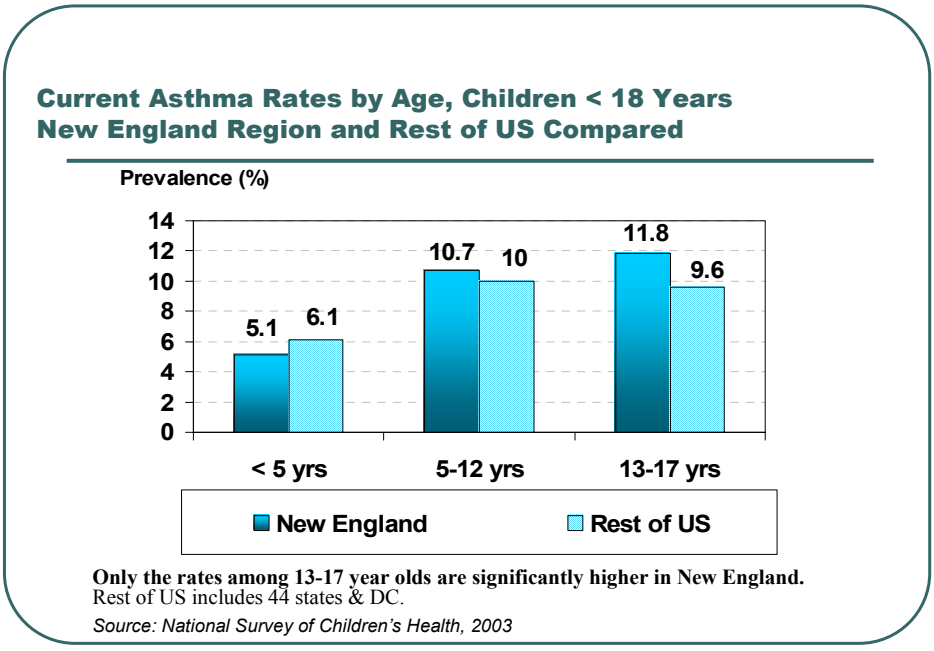
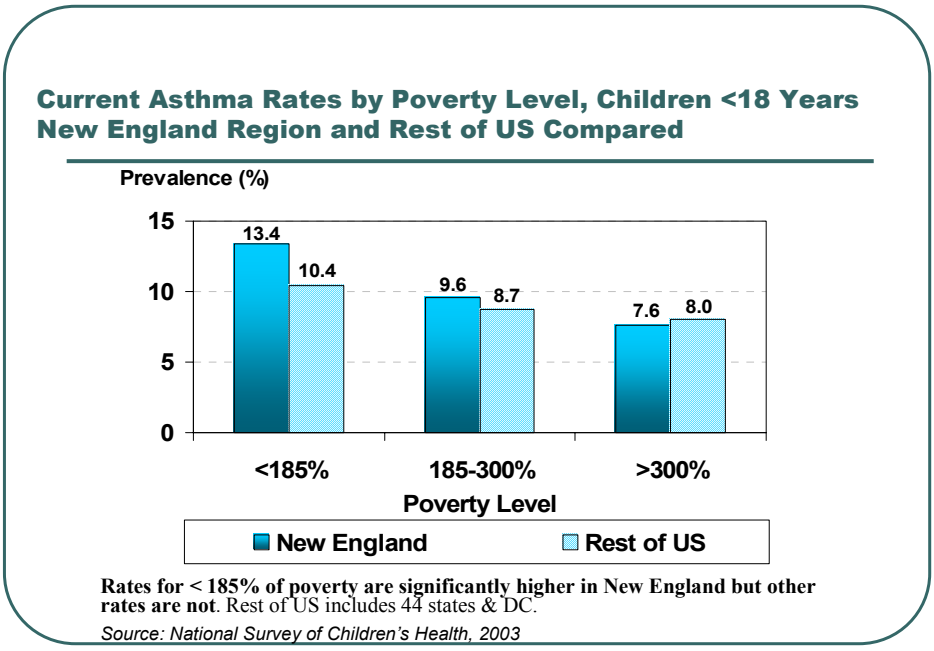


Figure 20. Asthma Regional Council



B. New England Adults

1. Asthma Prevalence (2004)

Highlights:

- Among New England adults age 18 and older, 15.0% had ever been told they had asthma, and 9.7% currently had asthma.
- Current asthma rates were statistically similar in all six states, but were higher among women (12.0% vs. 7.1% for men), younger adults (12.5% for 18-24 year olds), and adults with household income below $25,000 (12.8%).

More than one in seven (15%) adults in New England had been told at some point in their life that they had asthma, and nearly one in every ten (9.7%) adults currently reported asthma. Thus, about 35% of adults with lifetime asthma no longer have it. Based on population estimates for 2004, over one million New England adults are currently affected by asthma. Both lifetime and current asthma rates were similar in all six New England States (Figure 21) and other results by demographic groups were also similar for the two measures (Supplemental Tables S-7 and S-8, starting on page 60). Unless otherwise noted, only results for current asthma will be presented in this section.

Current asthma rates for adults were higher among women (12.0% vs. 7.1% for men; Figure 22), in contrast to the result for children, but similar to national findings. Current and lifetime asthma

rates were both higher among younger adults (Figure 23), even though older adults had potentially more opportunities over their lifetimes to be diagnosed. In contrast to the results for children, adult asthma rates were not associated with ethnicity, a finding consistent with 2001 data.

Both lifetime and current adult asthma rates were associated with household income. Current asthma rates ranged from 8.5% for those with household incomes above $75,000 to 12.8% for adults with household incomes less than $25,000 (Figure 24). Current, but not lifetime asthma rates were associated with educational attainment among adults, with rates generally higher among those with less education and lower for those with college degrees (Supplemental Tables only).

The greatest differences between demographic groups were seen for current asthma and employment status, where rates varied from 7.9% for retired persons to 20.7% among adults who reported they were unable to work (Figure 25). Unmarried persons, who were likely to be younger than married persons, also reported significantly higher asthma rates than married persons (Supplemental Tables only).

As was the case for children, both lifetime and current asthma rates were associated with body weight, with highest rates among the obese (18.8% for lifetime and 13.1% for current; Figure 26). Current smokers were also much more likely than non-smokers to report asthma (Figure 27).

Figure 21. Asthma Regional Council

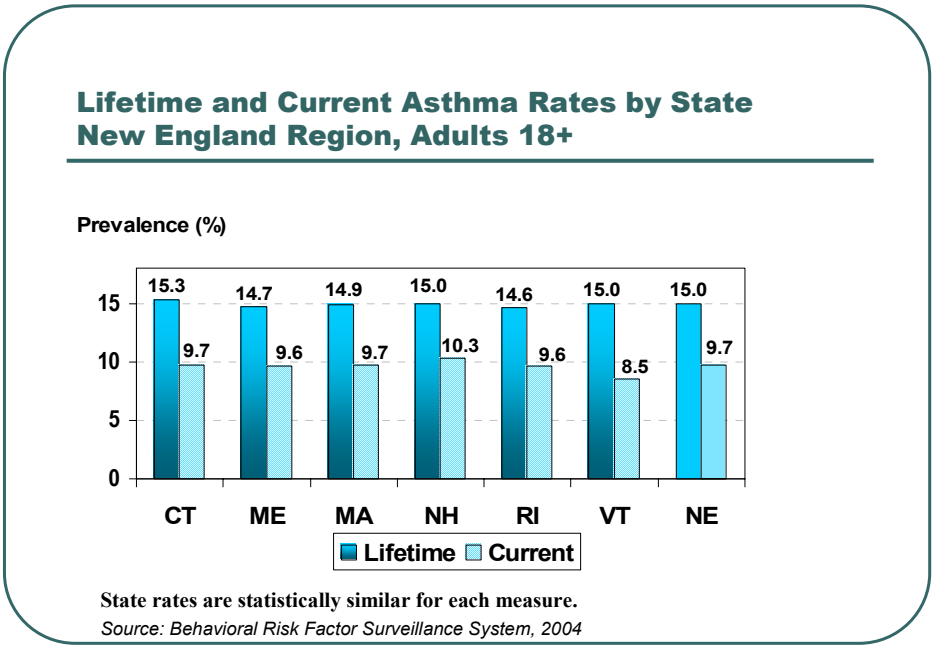


Figure 22. Asthma Regional Council

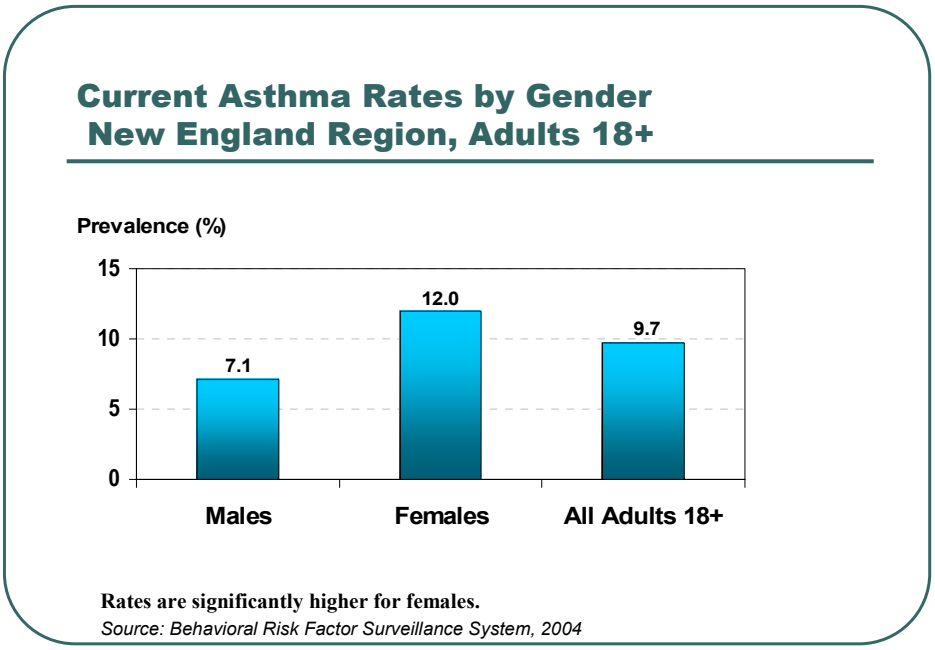


Figure 23. Asthma Regional Council

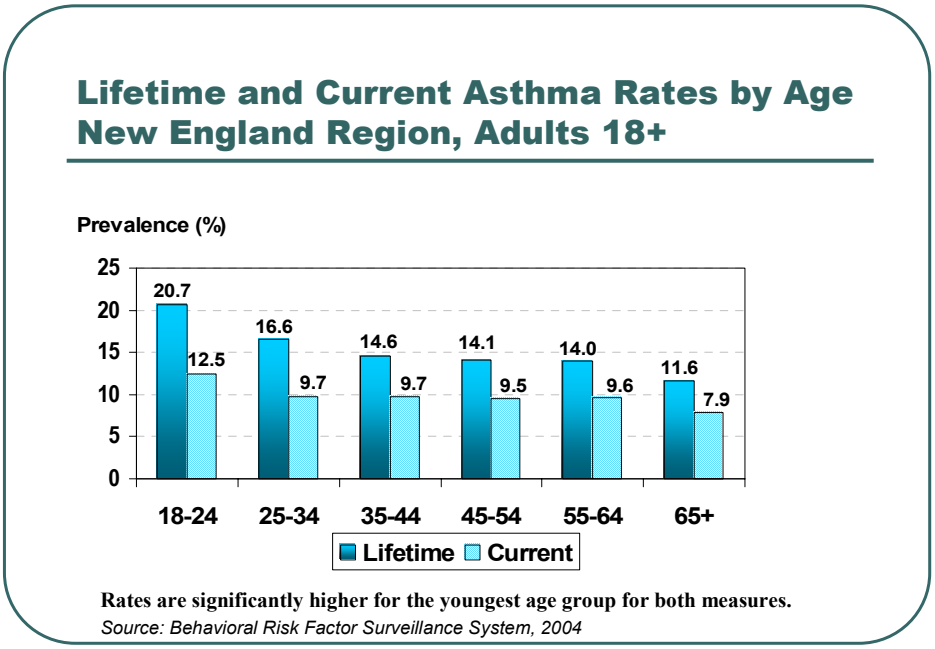


Figure 24. Asthma Regional Council

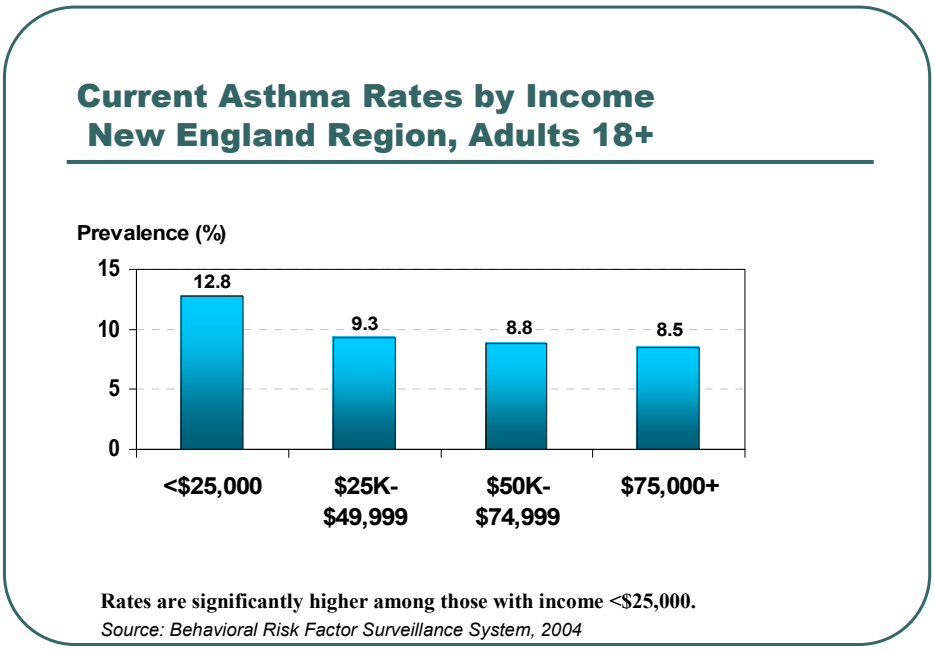


Figure 25. Asthma Regional Council

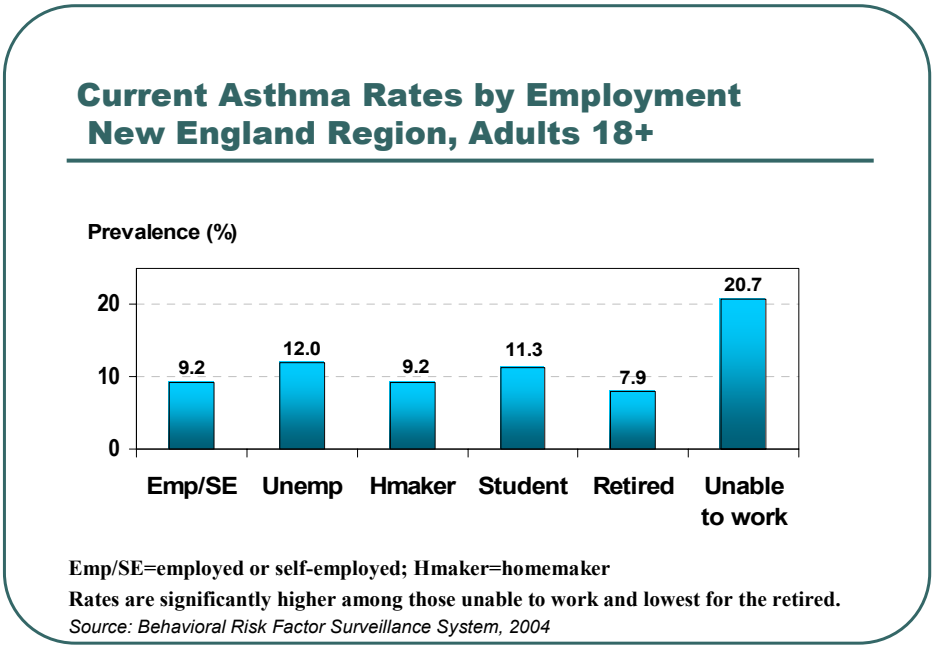


Figure 26. Asthma Regional Council

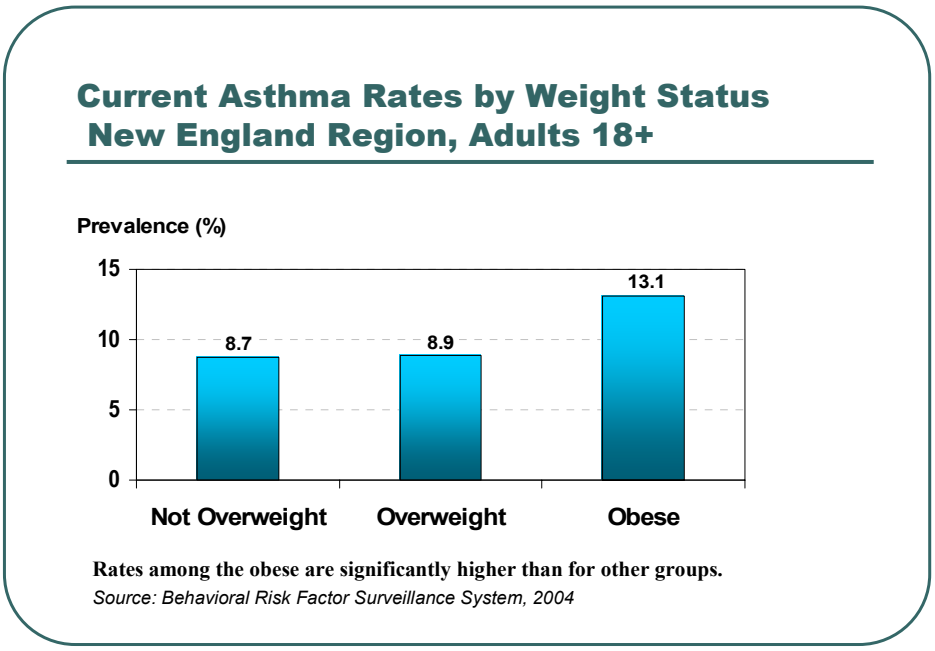
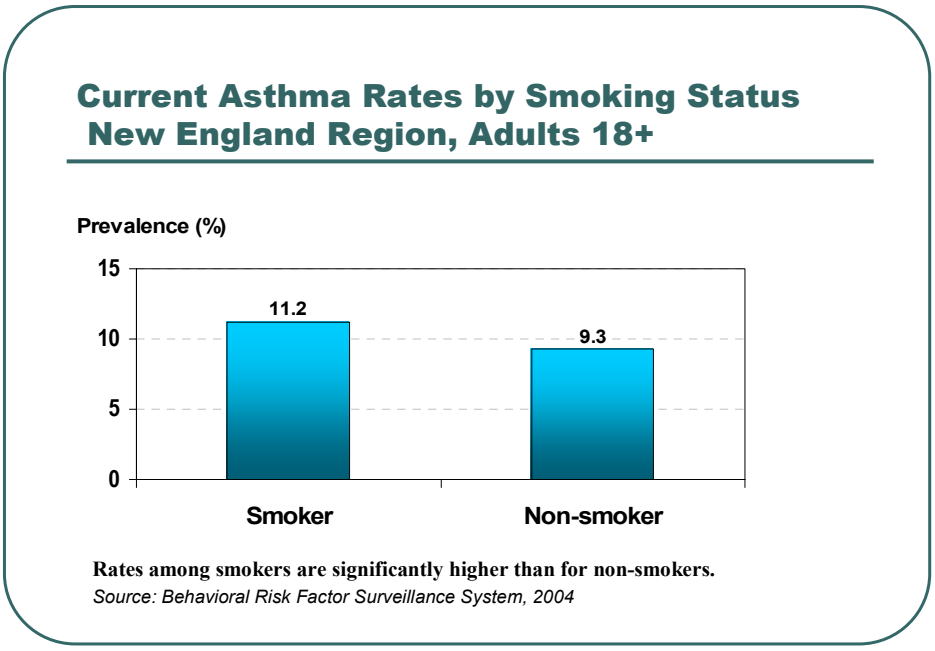


Figure 27. Asthma Regional Council



2. Burden of Asthma on New England Adults and Disparities among Sub-groups

Highlights:

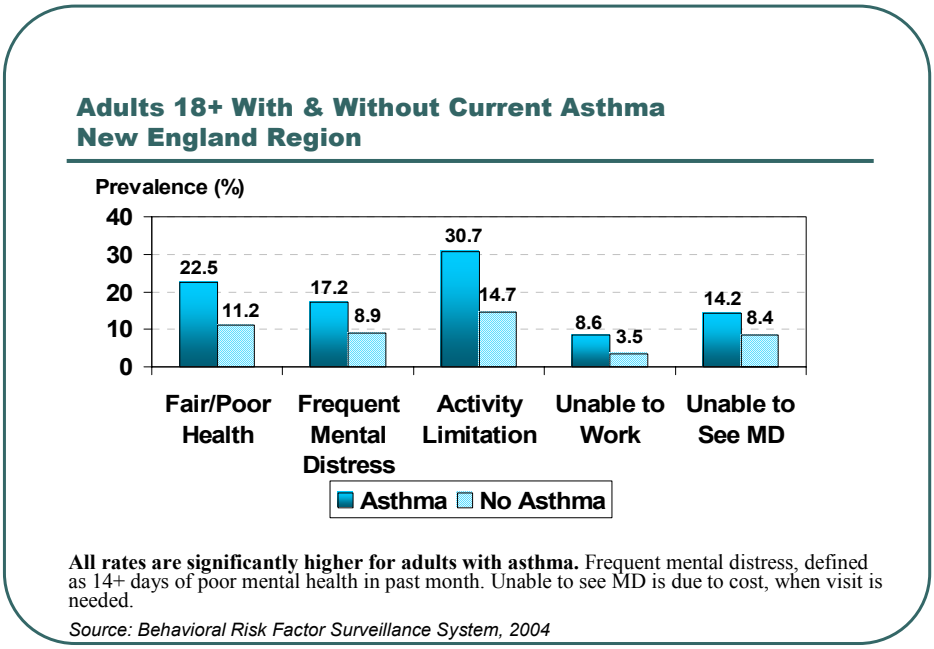
- New England adults with current asthma were much more likely than those without asthma to report fair or poor health, frequent mental distress, being unable to work, and activity limitations
- Lower income and minority adults with asthma were more like to report these same measures of asthma burden than higher income or white adults with the disease.

Although the BRFSS did not include questions that specifically addressed the asthma burden, the survey included a number of standard measures of health status, quality of life, and access to care that were used to address the issue. Thus the measures of asthma "burden" for adults are different from those used for children. Results for these measures were compared for adults with and without asthma, and disparities among the 3,361 surveyed New England adults with asthma were also assessed by state, gender, age, race, and household income. Only the key findings are reported here.

Three in ten adults with asthma (30.7%) reported an activity limitation, 22.5% were in fair or poor health, 17.2% reported frequent mental distress (FMD; defined as 14 or more days of poor mental health in the past month), and 8.6% were unable to work (Figure 28). Although adults without asthma may have other health conditions, adults with current asthma were consistently about twice as likely as those without asthma to report each of these measures of burden. Access to health care also appeared to be an issue for adults with current asthma, as they were more likely to report being unable to see a doctor when needed in the past year (14.2% vs. 8.4%), although rates of being uninsured were similar. Adults with asthma were also more likely to report no recent leisure time exercise (25.1% vs. 19.4%; Supplemental Tables only).

There were gender differences among these "burden" measures, with women with asthma more likely than men to report frequent mental distress (20.0% vs. 12.0% for men), activity limitation (32.9% vs. 26.6%), and being unable to work (12.8% vs. 6.8% for men; Supplemental Tables Only). The most significant disparities in asthma burden among adults were seen for race/ethnicity and income, as shown in Figures 29 and 30. Blacks and/or Hispanics with asthma were consistently more likely than whites to report fair or poor health status, frequent mental distress, being unable to work, being unable to see a doctor when needed due to cost, and being uninsured (Figure 29). Among adults with asthma, there was a strong (and significant) indirect association between these same measures of asthma burden and household income (Figure 30): as asthma burden increased, household income decreased. In addition, lower income adults with asthma were more likely to report an activity limitation, varying from 19.2% for those with incomes of $75,000 and above, to 49.6% for those with incomes below $25,000 (Supplemental Tables only).
Results for income were often the most dramatic and clear-cut of any of the demographic measures used to assess the disparities in asthma burden.

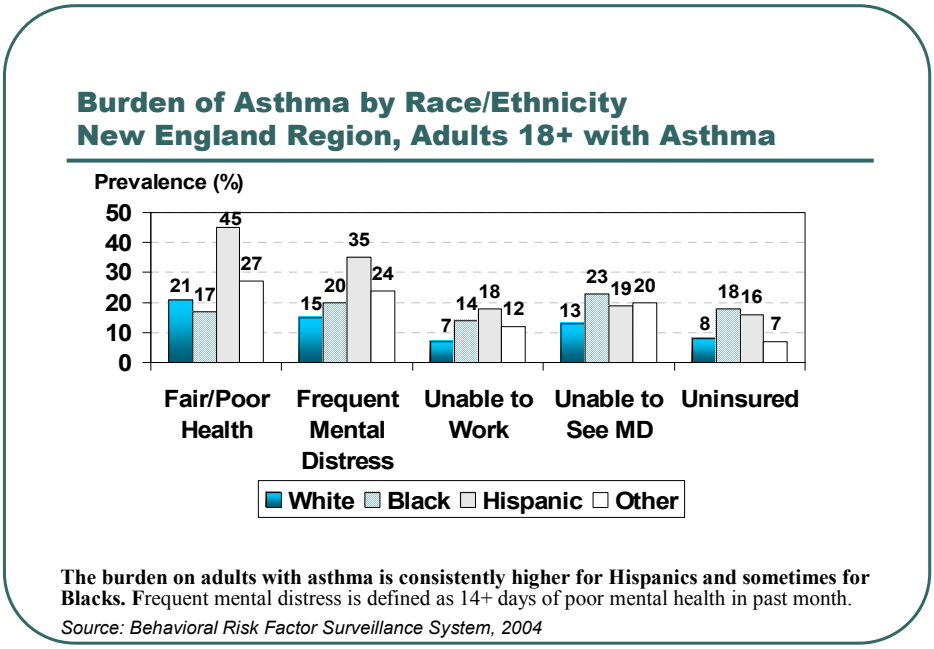
Figure 28. Asthma Regional Council



All rates are significantly higher for adults with asthma. Frequent mental distress, defined as 14+ days of poor mental health in past month. Unable to see MD is due to cost, when visit is needed.

Source: Behavioral Risk Factor Surveillance System, 2004

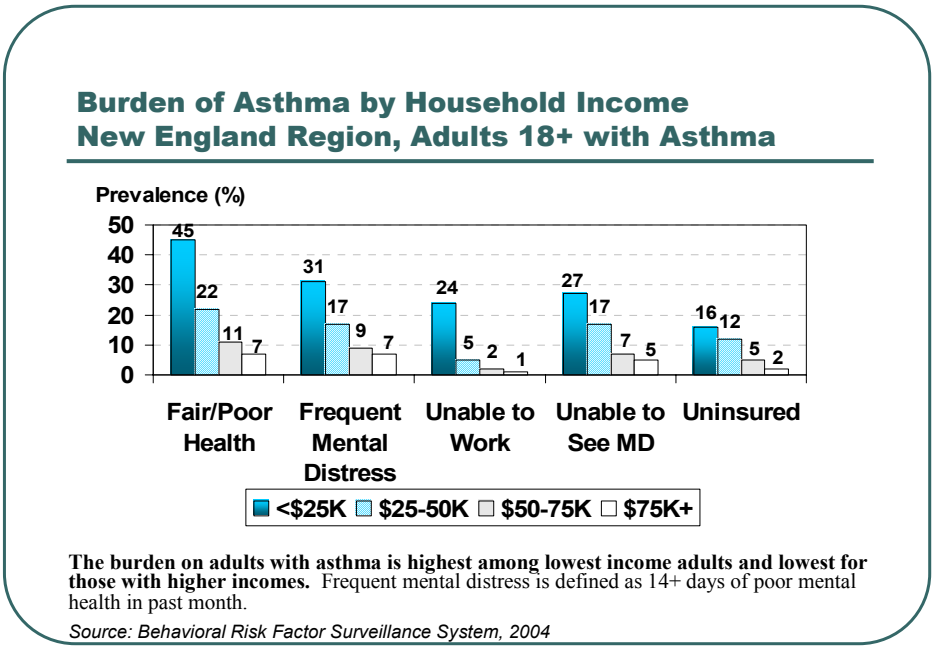
Figure 29. Asthma Regional Council



The burden on adults with asthma is consistently higher for Hispanics and sometimes for Blacks. Frequent mental distress is defined as 14+ days of poor mental health in past month.

Source: Behavioral Risk Factor Surveillance System, 2004

Figure 30 Asthma Regional Council.



The burden on adults with asthma is highest among lowest income adults and lowest for those with higher incomes. Frequent mental distress is defined as 14+ days of poor mental health in past month.

Source: Behavioral Risk Factor Surveillance System, 2004

3. Perception of Environmental Factors as a Source of Illness or Symptoms

Note: Because ARC is interested in environmental factors that influence asthma, we analyzed the first-ever questions on the BRFSS that have to do with environmental exposures and their perceived effects on adult health in general. Though the environmental illness questions were not asked specifically in relation to asthma, we compared responses between asthmatics and non-asthmatics to these general questions to ascertain whether there was a difference.

Highlights:

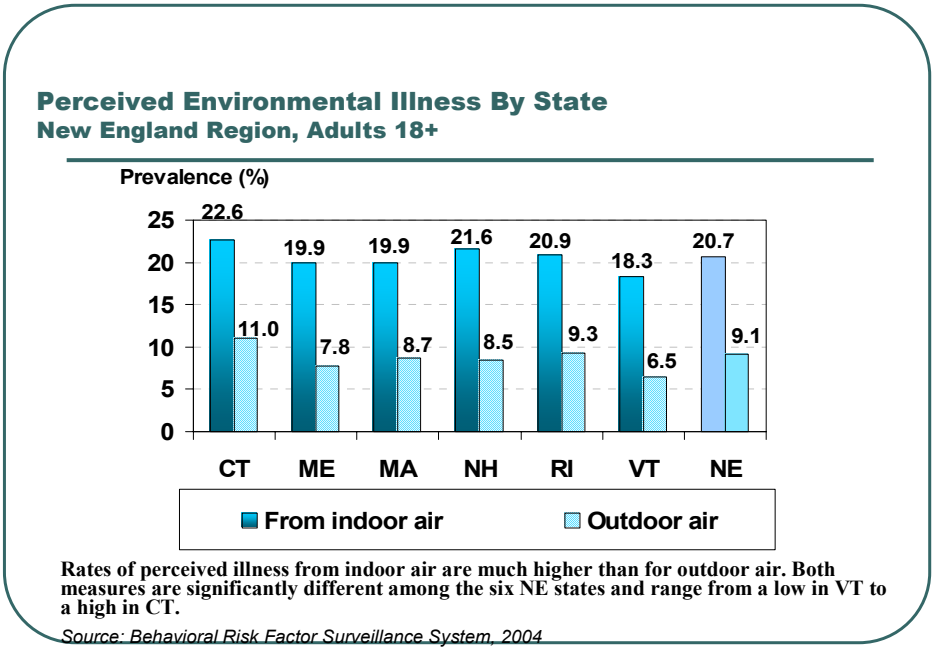
- One in every five New England adults (20.7%) reported an illness or symptoms they thought was due to poor indoor air, while 9.1% reported a perceived illness due to outdoor air pollution.
- Adults with current asthma were 2.5 times as likely as those without asthma to report a perceived illness (not necessarily asthma-related) from indoor air and nearly four times as likely to report such an illness from outdoor air pollution.

Results for all adults: One in every five adults (20.7%) in New England reported an illness or symptoms they thought was caused by poor indoor air quality. There were significant differences among the New England states where the rate varied from 18.3% in Vermont to 22.6% in Connecticut (Figure 31). Younger adults (28.1% for 18-24 year olds), women (23.6%), Blacks (27.2%), adults in lower income households (22.3 for <$25K and 22.5% for $25-$50K)), and adults with some college education (23.1%) were among demographic groups most likely to report such illness (Supplemental Tables). Adults with frequent mental distress (35.6%), those unable to work (30.0%), the disabled (28.9%), smokers (24.3%), and the obese (23.6%) also reported elevated rates of perceived illness from indoor air.

Reported rates of perceived illness due to outdoor air pollution were less than half the comparable rates for indoor air pollution (9.1% vs. 20.7%). These rates also varied by state, from a low of 6.5% in Vermont to 11.0% in Connecticut (Figure 31). Demographic patterns for perceived illness from outdoor air were similar to those observed for indoor air, except that differences for age groups, educational attainment, or smoking status were not significant. Reports of perceived environmental illness for both indoor and outdoor air pollution were lower in New England compared with the rest of the US. Nevertheless, a high percentage still believed there was a correlation between an illness and an exposure they experienced.

Adults with and without asthma: New England adults with asthma were 2.5 times as likely as those without asthma to report perceived illness from indoor air pollution (48.8% vs. 17.6% respectively) and nearly four times as likely to report such perceived illness from outdoor air pollution (27.6% vs. 7.0% respectively; Figure 32). Such illness may or may not have been asthma-related. In both cases, the rates among adults with current asthma were higher than rates for any of the demographic groups discussed above.

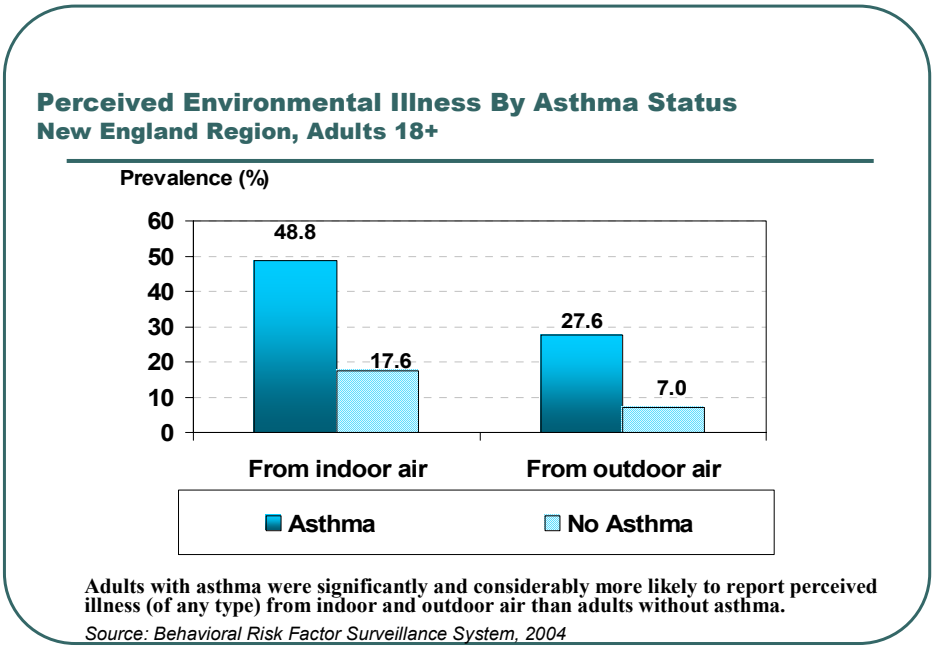
Figure 31. Asthma Regional Council



Rates of perceived illness from indoor air are much higher than for outdoor air. Both measures are significantly different among the six NE states and range from a low in VT to a high in CT.

Source: Behavioral Risk Factor Surveillance System, 2004

Figure 32. Asthma Regional Council



4. Change in Adult Asthma Rates in New England, 2001-2004

Highlights:

- Lifetime and current adult asthma rates in New England increased significantly between 2001 and 2004, although the increase for current asthma was due to an increase among women, while rates for men remained constant
- The total number of adults with lifetime asthma increased from an estimated 1.3 million in 2001 to 1.62 million in 2004.
- The total number of adults with current asthma increased from an estimated 941,500 in 2001 to over 1 million in 2004.

The Asthma Regional Council previously reported adult asthma prevalence rates using the 2001 BRFSS data.[9] Those results indicated that 12.7% of all New England adults had ever been told they had asthma and 8.9% currently had asthma, with differences found between men and women. In Table 1 these earlier results are compared with the 2004 data for New England adults from this current report. These results indicate that the lifetime adult asthma rates for all adults, (and for both men and women) and the current asthma rates for all adults (but for women specifically) increased significantly between 2001 and 2004. Results indicate that the current asthma rates for men were unchanged.

Table 1.
New England Adult Asthma Rates 2001 & 2004
Behavioral Risk Factor Surveillance System

	2001		2004		P value for Difference
	Rate (%)	95% CI*	Rate (%)	95% CI*	
Lifetime Asthma					
All Adults	12.7	12.2-13.2	15.0	14.4-15.5	<0.0001
Men	10.9	10.2-11.7	12.2	11.4-13.1	0.020
Women	14.3	13.6-15.0	17.5	16.7-18.3	<0.0001
Current Asthma					
All Adults	8.9	8.5-9.4	9.7	9.2-10.2	0.027
Men	7.0	6.4-7.6	7.1	6.5-7.8	0.783
Women	10.8	10.2-11.4	12.0	11.4-12.7	0.006
*The 95% CI (Confidence Interval) is the range of values around the estimated value within which the "true" value probably lies. If the survey were repeated 100 times, the "true" value would be expected to fall within this range 95% of the time.					

5. New England Adults and the rest of the US compared

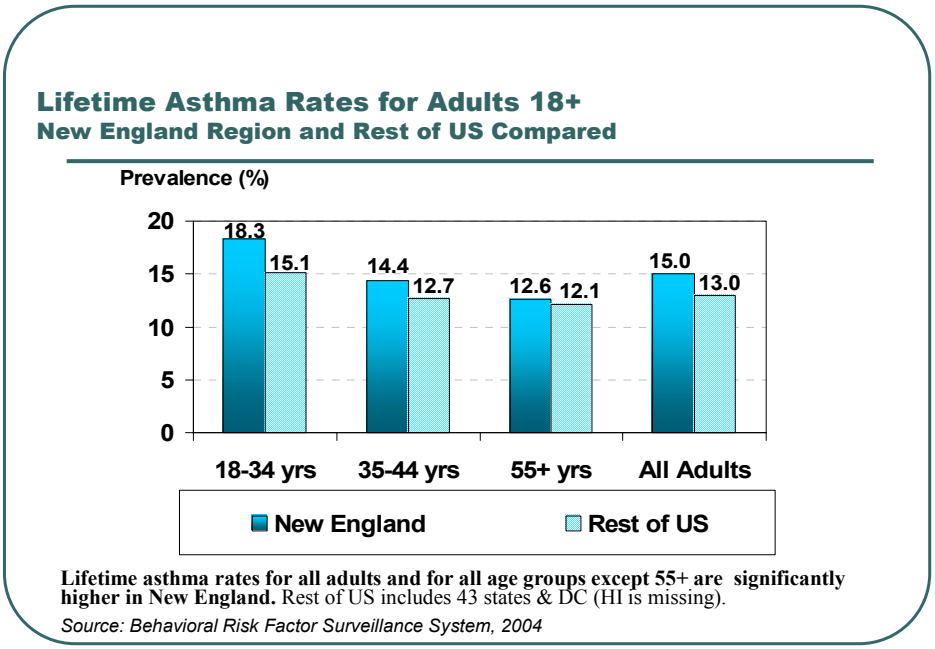
Highlights:

- Adult current asthma rates in New England are higher than any of the other ten Health and Human Service Regions.
- Both lifetime and current asthma rates among New England adults were significantly higher than the comparable rates for the rest of the US except among adults ages 55 and older.

Lifetime Asthma: Lifetime asthma rates were significantly different among the ten HHS Regions. The lifetime asthma rate of 15.0% for New England adults reported earlier was the second highest rate among the ten Regions, second only to the 15.3% rate in Region X. The lifetime asthma rate for New England adults was significantly higher than the comparable rate for the rest of the US (excluding Hawaii because data were not available, and including D.C), which was 13.2%. When these results were examined for three separate age groups, New England adults 18-34 year olds and 35-54 year olds, but not those 55 and older, reported significantly higher lifetime asthma rates than comparable aged adults in the rest of the US (Figure 33).

Current Asthma: Comparing the ten Health and Human Services Regions, current asthma rates among adults were significantly different, with the New England rate of 9.7% being the highest, exceeding the second highest rate (found in Region X) by 0.5%. Comparing current adult asthma rates in New England with the rest of the US, the New England rate was again significantly higher (9.7% vs. 8.0% for the other 43 states and DC; Figure 33). And consistent with the results for lifetime asthma, the results for three separate age groups showed that only the current asthma rates among adults 55 and older were similar for New England and the rest of the US (Figure 34).

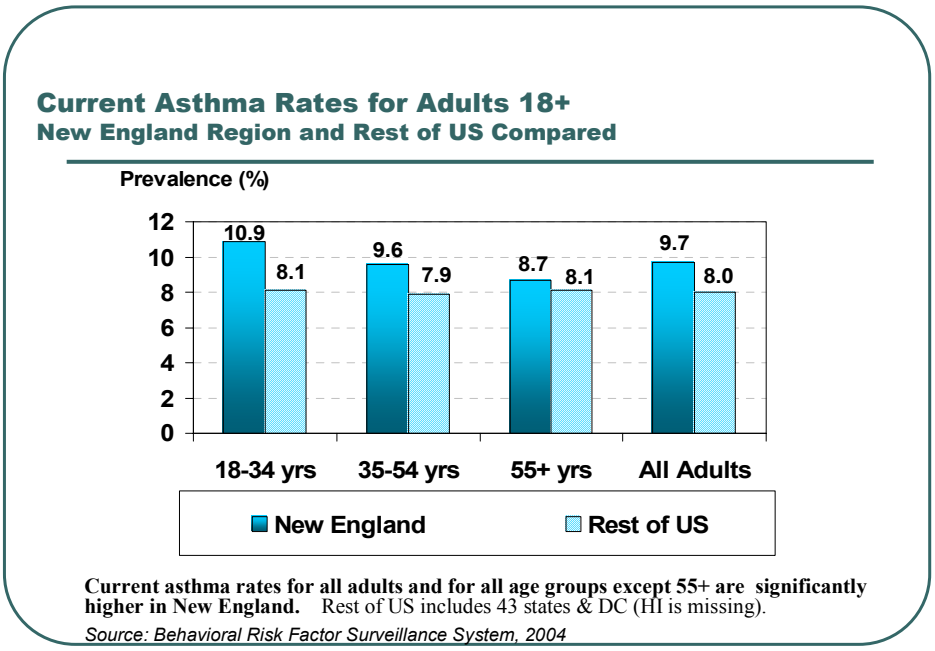
Figure 33. Asthma Regional Council



Lifetime asthma rates for all adults and for all age groups except 55+ are significantly higher in New England. Rest of US includes 43 states & DC (HI is missing).

Source: Behavioral Risk Factor Surveillance System, 2004

Figure 34. Asthma Regional Council



Current asthma rates for all adults and for all age groups except 55+ are significantly higher in New England. Rest of US includes 43 states & DC (HI is missing).

Source: Behavioral Risk Factor Surveillance System, 2004

III. DISCUSSION

The results in this report show that asthma remains a significant and growing health problem in New England. They clearly indicate that New England asthma rates for both adults and children are higher than most other parts of the country, and that asthma adversely affects health and well-being. Moreover, in contrast to the notion that the disease is leveling off, the number of New England adults and children affected by the disease appears to have increased between 2001 and 2004. The estimated number of New England adults and children affected by lifetime asthma increased from 1.7 million in 2001 to 2.1 million in 2004. For current asthma the figures were an estimated 1.2 million in 2001 and over 1.3 million in 2004. The picture is generally similar in all six states, but some sub-populations, such as Hispanic children and lower income persons, appear to be more affected by this disease. Since Hispanic families have the lowest income among the racial populations analyzed in this report, it is unclear whether race or income is the primary factor in the disparity.

Possible reasons for high New England asthma rates: Of course, there can be many reasons for higher asthma rates in New England, and a report such as this cannot provide the definitive explanation. Some of the factors that one would expect might explain differential asthma rates include higher rates of diagnosis (perhaps due to better access to medical care), demographic characteristics of respondents, and unique environmental factors in the region. However, if greater access to care could fully explain higher rates of diagnosis, then states with high insurance coverage would also be expected to have the highest asthma rates. Based on our state by state comparison of adult asthma rates and insurance rates[11], these two factors do not seem to be correlated. Thus greater access to care is unlikely to be the sole reason for the high rates in New England. In addition, better access to care would not explain higher rates of asthma among the demographic groups in New England that are more likely to report asthma (e.g. persons from lower income households, Hispanic children, children in single parent households).

Demographic differences in the New England population are also an unlikely cause of the higher asthma rates. For such differences to affect asthma rates to the extent seen here, there would need to be significant population differences compared with other parts of the country. For example, because the results were not age adjusted, the age distribution of the populations could affect the results. However, the results comparing New England to the rest of the US were determined for separate age groups and found to be consistently higher in New England, except among older adults. Similarly, if there were a much higher proportion of Hispanic children in New England compared with other states, this might also account for the overall higher asthma rate. Based on census data, this does not appear to be the case. Census data do indicate, though, that many of the Hispanics in New England are of Puerto Rican descent, which may be a factor in the results. Demographic differences may affect rates in certain geographic areas of the region, however, such as the larger cities. The reason for the higher asthma rates in New England overall remains elusive and suggests the need for further study that considers the possible role of environmental factors.

Perceived environmental illness: The finding that adults with asthma were two and a half to four times as likely as those without asthma to believe that a recent illness (not necessarily asthma-related) was a result of an environmental exposure is interesting in light of the fact that environmental factors have been shown to be related to asthma.[12] While the validity of

these new questions has not been extensively tested, there is no reason to believe that people with asthma would interpret or answer the questions differently from those without asthma. However, persons with asthma may be more likely to attribute illness to environmental conditions and be more aware of irritants and triggers. The results support the idea that the respondents believe that environmental factors contribute to illness and may affect asthma, but do not provide any information on the seriousness of the illness, or if it was related to asthma. In addition, the questions do not indicate what environmental factors might play a role in the perceived illness.

Gender differences: The results showing higher rates for boys on the children's survey and higher rates for women on the adult survey has been noted in previous studies.[13] According to results from the two data sets used for this report (based on data for all states) this shift appears to happen sometime in the teenage years. It is possible that female sex hormones are involved, since estrogen has been found to affect asthma.[14] We have no explanation for the increase in current asthma rates among New England women, while the rate for men remained constant between 2001 and 2004. Occupational exposures should be considered when examining sex differences, since educational services and health care industries, where many women are employed, comprise 13% and 30% respectively of the cases reported to the Massachusetts Department of Public Health (1993-2004), which monitors occupational asthma. Again, more study is warranted.

Effect of income on results: Household income may be affecting many of the results, due to confounding. Income was measured on the child survey in terms of Federal Poverty Level (FPL) and in the BRFSS in terms of household income, and they cannot easily be compared without knowing the exact income and family size. Thus the FPL and income groups used may not represent comparable levels of income among adults and children. Despite this, results for income are quite clear for both children and adults: in terms of asthma prevalence and burden of the disease, persons in lower income households are more affected by asthma. In addition, income tends to be associated with other demographic factors, such as race/ethnicity, education, employment, age, number of adults in the household (single parents e.g.), and region of the country, so some of those results may also be related to income differences between or among the groups.

Because household income in New England tends to be high in relation to other parts of the US, the finding shown in Figure 20 is interesting. That figure compares child asthma rates in New England and the rest of the US according to the federal poverty level (FPL). For adults, current asthma rates are higher in New England than the rest of the US among *all* income groups, and the overall New England asthma rate is significantly higher than for the rest of the US. Yet among children (Figure 20), current asthma rates are similar for New England and the rest of the US for the upper income groups (based on FPL), which include most households. NE current child asthma rates are only significantly higher than the rest of the US among the *lowest income group,* which accounts for only a fraction of all children with asthma. As a consequence, the overall New England current asthma rate for children is not significantly higher than the rest of the US, although it is still the second highest among the ten regions. Because the majority of New England households are above 300% of the FPL, this implies that the relatively small number of lower income households increases the overall asthma rate so that it is among the highest in the country. These results also suggest the need for further exploration, as there may be some geographic, demographic, healthcare, socioeconomic, and/or environmental factors (such as housing) involved that need to be better understood.

Disparities in burden: While the high regional asthma rates are of concern in general, for low-income persons in New England, the picture is even more dismal. For a start, among both adults and children, persons in lower income households tend to have higher asthma prevalence rates than those from higher income households. Then, as noted above, the asthma rates for lower income households in New England are consistently higher than among comparable lower income households in other parts of the country. In addition, persons in lower income households who do have asthma consistently report a greater burden than those in households with higher income. This remains true for all the types of burden examined. Many of these results are quite dramatic and indicate results for persons with asthma in lower income households that are often two or three times as great as those for the highest income groups, and up to 20 times as great for low income adults with asthma who are unable to work when compared with persons in the highest income group.

For race and ethnicity, the picture is more complicated than for income, and is probably affected by small sample sizes. Hispanic children, but not minority adults, are more likely than whites to have asthma. This discrepancy between the results for children and adults by ethnicity needs further investigation, but is consistent with results found for 2001. But for minorities who have asthma, their reported burden appears to be greater than for whites with asthma for both children and adults. Some possible reasons for the asthma burden to appear to be greater for families of low income and minority children are suggested by the results for health care utilization. While the burden on the child's family is not defined for the respondent, it is not difficult to imagine that more hospitalizations and/or emergency room visits would translate to a feeling of a greater burden, being harder to care for, and that the child requires more of a sacrifice. It is a possibility that the respondent may have been considering other factors when answering the questions.

The particular finding that minority children with asthma are more likely than white children with asthma to have been hospitalized may explain apparent discrepancies between this study and studies that are based primarily on hospital data. Because Black and Hispanic children with asthma are more likely than white children with asthma to be hospitalized for their asthma, studies based solely on hospitalization data will tend to overestimate asthma rates for these minority children. While this report found that Black children with asthma were more likely to be hospitalized for their asthma, their actual current higher asthma prevalence rate did not reach statistical significance. But if only hospitalizations were examined, one might draw a different conclusion about asthma rates. The reason for these excess differences in hospitalizations is unknown and could be due to inadequate monitoring of the disease, differences in the severity among groups with the disease, or other factors such as ability to access a physician.

The findings that examine the burden among children and adults with asthma also appear to be consistent with findings among all persons regardless of asthma status, which were not reported here. For example, older adults – whether they have asthma or not - tend to report poorer general health status, and women are more likely than men to report frequent mental distress. Thus, the patterns in disparities found among persons with asthma appear to be consistent with other findings. Additional study will be needed to determine if the disparities among persons with asthma are more or less pronounced than those for persons without asthma.

Confirmation of earlier findings: These current findings confirm results reported in previous ARC reports.[9,10] For example, both reports found that asthma rates are high in New England, and that rates peak among teens and young adults. Results were also consistent for household income for both adults and children. These latter results also confirm the higher asthma rates among children in single parent households and households with a smoker reported for 2001. For adults, the 2004 results confirm earlier findings of higher rates among women, obese persons, and current smokers.

Distinction between current vs. lifetime asthma: It is quite clear from the results presented here, especially for children, that the difference between "lifetime" and "current" asthma is not clear-cut. For example, many children with current asthma were not reported to have had a recent asthma attack, but some with lifetime (but not current) asthma were reported to have had an attack in the past year. A few children with lifetime, but not current asthma were reported to have been hospitalized for asthma in the past year. Lifetime asthma was clearly defined for the respondent, but current asthma was not, so respondents may have used different perceptions for that measure. Self-reporting is almost always an issue for survey data, but all surveys have this limitation. In the case of this child survey, the adult who knew most about the child's health was the respondent, not the person who answered the phone or was randomly selected. And an adult reporting on childhood asthma would appear more reliable than the child reporting a diagnosis. In addition, several measures, including the burden of asthma on the family, were based on the respondents' perception and not based on any quantitative measure.

Change in asthma rates 2001-2004: Results presented in this report appear to contradict reports of a leveling off of asthma rates in the past few years[2-4]. The estimated numbers of persons with current asthma in New England have increased from 941,500 adults and 288,100 children in 2001 to over one million adults and 330,000 children in 2004. Lifetime asthma estimates for both adults and children increased from 1.7 million in 2001 to nearly 2.1 million in 2004. Among both adults and children, the actual asthma rates in 2003-2004 were consistently higher than those reported for 2001. For children, although direct comparisons were not made because the surveys were different, the 2003-04 current asthma rate of 9.6% was numerically higher than the 8.7% rate reported for 2001. For the adults, where comparisons are possible because the data source is the same, the lifetime and current asthma rates for adults increased significantly between 2001 and 2004. (However the current rates only increased significantly for women.) These trends will need to be followed to see if the rates continue to increase.

Follow-up: As noted earlier in the report, Hispanics (and other minorities) tend to have lower incomes than whites, so it is difficult to isolate the effects of race/ ethnicity vs. income. The same is true for other possible "confounders" such as age and family structure, which vary among population sub-groups and also among the factor being studied (in this case asthma rates or burden). In addition, many of the groups that show an increased burden due to asthma are the same demographic groups that show disparities in health among all persons or non-asthmatics. Additional analysis of these same data could be done to control for factors such as age, gender, income, state of residence, family structure, body mass index, and race/ethnicity in an effort to determine which of these factors contributes the most to the disparities. For example, such results would show whether Hispanics still had greater child asthma rates when income differences were taken into consideration. Additional studies that include other factors which might affect asthma, such as type and age of the home, stress, allergen exposure, time spent indoors, and adult occupation will also be valuable. Those are

just two of the steps that might help to resolve some of the unanswered questions about the burden of asthma in New England.

IV. CONCLUSIONS

This report helps us understand how many people in New England are suffering from asthma, who is most affected by the disease, and how it impacts their lives so that we can direct our resources in the most effective and efficient ways possible.

Asthma prevalence in New England is significantly higher than the rest of the country, and the numbers of people affected are increasing.

Asthma is a national public health epidemic that, for reasons still unknown, continues to disproportionately impact New England (NE). Approximately 14% of NE children and 15% of NE adults have suffered with asthma in their lifetimes. Using 2004 Census estimates, this would mean that over two million people have experienced asthma in our relatively small region.

New England asthma rates for both adults and children are consistently higher than the rest of the country. In fact, NE adults and children have among the highest regional rates of current and lifetime asthma among the ten U.S. Department of Health and Human Service regions (Tables S-5,6,13,14). In addition, of the eight states with the highest adult current asthma rates in the country, five of them are NE states (Table E). Moreover, the prevalence of the disease appears to be escalating in NE adults overall. This is in contrast to national trends which suggest that asthma prevalence has stabilized over the last few years.[15] We could not determine if rates have increased among children due to the different survey instruments used during the time period.

Smokers, Children exposed to smoke, and Obese individuals have higher asthma rates.

Certain unhealthy behaviors are clearly linked to asthma (Figures 7, 8, 26, 27). Smoking and obesity have strong correlations with the disease. Children living in homes with smokers were 44% more likely to develop the disease. Asthma is another reason why public health professionals need to continue their focus on these two largest contributors to morbidity and mortality in this country, and address the institutional and social factors that foster their prevalence.

Many New Englanders believe environmental conditions have affected their health.

Because the NE population has not significantly changed demographically in the past 3 years (US Census), it is reasonable to surmise that environmental factors may have a role in the region's increasing prevalence trends. Many New Englanders expressed environmental concerns, with 30% believing that an illness or symptoms they experienced in the past year were probably caused by an environmental exposure (Fig. 31, 32). Not surprisingly, those with asthma were more likely to believe there was a connection between their health and the environment, especially concerning indoor air contaminants. These self-reported perceptions about the link between health and environmental factors warrant further investigation.

Certain populations are more likely to have asthma.

Asthma affects everyone—old and young, rich and poor, urban and rural, whites and blacks, men and women. But there is no question that the disease is more prevalent, and its consequences more severe, among certain groups of people.

Gender and Age: Childhood asthma is more frequently seen in males, while adult asthma is more frequently experienced by females. The disease is most prevalent overall in teenagers and young adults.

Racial and Ethnic Disparities: Black and Hispanic children appear to have higher rates of asthma than white children, but only the difference between Hispanic and white children reached statistical significance. Black children in New England, however, were more likely to be hospitalized and Hispanic children were more frequently reported to be depressed and in poorer health than all other children with asthma.

Surprisingly, there were no significant racial or ethnic disparities in adult asthma rates. (These findings are in contrast with national data analyzed by the American Lung Association, which demonstrates that rates are highest among non-Hispanic Blacks.) However, Hispanic adults with asthma suffered disproportionately in areas of overall health, mental health and being unable to work compared with other asthmatics. Further, Black adults with asthma had the highest rates of not being able to see a physician when needed, and being uninsured.

Socio-Economic Status: Income is strongly correlated with higher rates of asthma. Rates are consistently highest for low-income children and adults, and lowest for the wealthiest groups. Children from one-parent families headed by a mother also have higher rates, but these families also tend to be lower income. Rates also tended to be higher in adults with the lowest educational attainment levels. Low-income adults with asthma were much more unlikely to have health insurance or be able to see a physician when needed (Fig. 30).

Asthma places a significant burden on many individuals and families, but low income populations appear to suffer the most.

This report demonstrates that asthma places a large burden on New England's children, adults, families and on all aspects of our society. It can have profoundly disruptive effects on personal well being, schooling, productivity, family finances, and health care utilization. And it disproportionately impacts our most marginalized citizens.

Burden on Children and Families: One in six adults caring for a child with asthma reported feeling that the illness had created a considerable burden for their families, and requires significant personal sacrifice. Based on the following report findings, this is not surprising. More than one in three children with asthma were reported to have significant health difficulties as a result of their disease and over one in five required special services or equipment not offered by their regular physician. In addition, children with asthma were reported to be more limited in their ability to do things other children their age do, and were nearly three times more likely to be frequently depressed. Children with asthma also missed significantly more days of school and required twice as many doctors' office visits for sick care. Missed school and frequent doctors' visits are situations that frequently require a

parent or other adult to remain home and potentially miss work, since children in respiratory distress require concerted adult supervision and assistance.

Burden on Adults: Children and their families are not the only ones affected by asthma; the disease takes its toll on adults as well. The greatest numbers of people who currently have asthma are adults, by far. Over one million adults in the region had asthma in 2004, and many more have experienced it in their lifetimes. In fact, New England adults had the highest regional rates of current asthma in the entire country. Further, both current and lifetime asthma have increased significantly during the three-year period analyzed.

Adults with asthma are consistently twice as likely to report difficulties in certain areas of health and well-being as those without the disease (Figures 28-30). For example, over 30% of adults with asthma reported an activity limitation, 22% considered themselves to be in fair or poor health, and 17% reported frequent mental distress-- yet 14% of adults with asthma could not see a doctor when needed, due to cost. Moreover, asthma in adults appears to significantly affect employment status. Nearly 9% of adults with asthma were unable to work and over 20% of adults who couldn't work reported having asthma. Adults who experience unemployment, depression and poor health cannot help but affect those who surround and care for them.

Burden on the Poor: One of the most striking findings is how poverty affects the lives of those with asthma. Comparing the poorest and wealthiest adults with the disease, people with asthma who are low income were six times more likely to report being in poor or fair overall health, four times more likely to be in frequent mental distress, 24 times more likely to be unable to work, five times more likely to be unable to see a physician when needed, and eight times more likely to be uninsured than their wealthiest counterparts.

The poorest children with asthma are more than twice as likely to experience moderate to severe difficulties related to their disease, are seven times as likely to be in poor or fair overall health, ten times more likely to be depressed, and more than twice as likely to experience an activity limitation than were their wealthiest counterparts. The poorest children also have the highest rates of hospitalizations and emergency room visits for asthma. Not surprisingly, their parents feel the greatest burden in terms of meeting their needs. It is enough to cope with the disease in isolation, but people living in poverty must contend with so many other complicating issues as well.

Economic Burden: According to the American Lung Association, asthma costs our society over $16 billion per year (in 2004 dollars) in medical and indirect costs, such as lost work time. This is a huge national price to pay for a disease that can be well-controlled.

More needs to be done to ensure the proper care and control of asthma.

Based on the number of children with asthma who experienced attacks and relied on urgent care, as well as the high percentage of adults with asthma who report being disabled or unemployed, a major conclusion of this report is that asthma is not a well-managed disease in New England. Although asthma is an eminently controllable disease, an alarming number of children appear to be receiving inadequate health care as evidenced by their considerable reliance on urgent care. In the year prior to the survey, one third of children with asthma were reported to have been taken to the emergency room, 5% required a hospitalization, and

nearly 60% had an asthma attack. This reality puts children and adults at dangerous risk, and places an added burden on their families, their schools, their workplaces, and on the health care delivery system.

Well-managed asthma patients, who are provided quality care consistent with national guidelines, would not be expected to require crisis interventions or experience life limitations to the degree we have seen in this report. Asthma can be properly managed if respiratory function is monitored, controller and rescue medications are appropriately administered, triggers are minimized, and there is education for patient self-management. This observation may indicate that providers are not well versed in national guidelines and best practices for controlling asthma, and that they may need more resources in order to devote proper attention to adequately educating patients and their families. It may also indicate that asthma care and medications are unaffordable.

It is incumbent upon us to understand why this chronic respiratory disease has become so prevalent in our society, and in particular, why New Englanders are so profoundly affected. If we are to effectively tackle the disease, then we must commit ourselves to policy changes that will reduce the incidence and prevalence of asthma, and to direct efforts to preventive public and environmental health measures. The following represent recommendations by the Asthma Regional Council of New England:

V. ARC RECOMMENDATIONS

1. **Increase research focusing on the root causes of asthma and the factors that contribute to its prevalence and severity.** This increased research should address the following questions which arise from this report:**.**
a) What causes asthma to initially develop in children and adults, beyond genetic factors?
b) What factors are contributing to our region's higher rates of asthma, and why doesn't the disease appear to be leveling off?
c) How do infectious and chronic diseases influence asthma, including the medications used to control them?
d) What is the connection between obesity and asthma?
e) What role does nutrition and exercise play in asthma prognosis?
f) What role does stress play in triggering asthma attacks? More longitudinal data is needed.
g) Why do Hispanic children have higher prevalence rates in our region, and why do certain minority groups appear to have more severe disease?

2. **Expand environmental health programs and research projects** There is tremendous public interest in understanding the role that the environment plays in causing and exacerbating asthma and other chronic diseases. Given that asthmatics believe, at very high rates, that the environment has influenced the onset of a recent illness, we need to explore this further by addressing the following research questions raised in this report:
a.) What specific indoor or outdoor pollutants are of most concern? With prevention as the goal, more long-term cohort studies are needed to address this question.
b) What characteristics of indoor environments contribute to asthma? Better personal exposure assessment tools are needed to answer this question.
c) What effect do everyday indoor chemical exposures have on our respiratory health, including volatile organic chemicals (VOCs), plastics, chlorine, building materials, pesticides and cleaning products?

d) Does climate change play a role?
e) Are ambient air alerts effective in reducing attacks in the population?
f) Using a community-based participatory model, what issues are of greatest importance to disproportionately affected communities, such as the Hispanic community?

3. **Increase congressional and state funding for environmental health programs that improve respiratory health status such as:**
a) HUD's Healthy Homes initiatives
b) The EPA's Tools for Schools, Healthy Communities, and Community Alliance for Renewed Environment (CARE) programs to study asthma
c) The CDC's Environmental Public Health Tracking program, which should be expanded to fund all of the states in the region
d) The CDC's state asthma programs, where clinical, surveillance and environmental programs are often integrated at the state level in a coordinated manner
e) State legislatures should supplement these federal programs.

4. **Expand clinical asthma management and social service programs for those who are suffering with asthma, with specific focus on groups with the heaviest burden.** We need to do a better job of controlling asthma, preventing attacks, and assisting patients with managing their disease. If we are to successfully tackle asthma and keep those at highest risk out of the hospital and leading productive lives, then the following steps are necessary:
a) Universal access to quality primary care services is essential.
b) Primary care physicians, and other health providers, need to be well-versed in national guidelines for managing asthma.
c) Reimbursed asthma education and home visiting services need to be the centerpiece for improved patient self-management.
d) Clinicians should prepare and disseminate written Asthma Action Plans for their patients, and copies should be automatically provided to parents and school nurses, who routinely care for students with asthma. Asthma Action Plans should be supplemented with environmental intervention strategies for patients.
e) Paraprofessionals, such as Community Health Workers, have an important role to play in helping families with their asthma burden and can help provide culturally and linguistically competent care. Formalized training competencies and programs for paraprofessionals need to be developed, and health payers should provide payment for these services.
f) School Nurses have routine contact with students. State legislatures should invest in, support and promote the school nursing infrastructure, a profession which is generally under-funded and extremely overburdened given the growth in many childhood chronic diseases. Not only would a robust school nursing program ensure better asthma surveillance, but it would enhance preventive care, treatment and ongoing monitoring of students. Additionally, each state should have a school medical advisor who can be a resource to school systems in developing appropriate policies and procedures.
g) Controller medications, and associated equipment, need to be made more affordable and available to patients in both homes and schools. Typical insurance co-payments for these medications are prohibitive.
h) Flu shots should be more broadly administered to those with asthma.
i) Greater attention needs to be paid to the psychological and social supports necessary for adults and children with asthma, in order to help them lead satisfying and productive lives.

5. **Reduce exposure to environmental tobacco smoke.**
a) State Tobacco Settlement Funds should be dedicated to programming associated with smoking reduction.
b) Educational and media campaigns to reduce adult smoking in homes and in automobiles should be paramount.
c) Smoke-free and allergy-free residential units should be built or set aside in public and subsidized housing developments.

6. **Promote standards and provide financial incentives for building and maintaining healthy homes and school facilities.**
a) Building materials and construction design should reflect appropriate building science and take into account the NE climate. (ARC's Healthy Homes Building Guidance)
b) Funding for school construction and renovation activities should be linked to appropriate designs and plans. These plans should support "green" buildings and healthy indoor air environments, and include energy efficiency goals.
c) Maintenance and operating practices should promote healthy environments and reflect national consensus standards**.**
d) Indoor air quality indicators for respiratory health need to be identified, and guidance on how to prevent, recognize, and remediate areas of concern should be promulgated. This guidance can assist facilities managers and health/building inspectors to prioritize and remediate environmental health and safety issues that may compromise occupant health and safety.
e) Occupancy during construction requires strict adherence to plans and protocols which protect occupants from hazardous dusts and chemicals, such as those provided by the Sheet Metal and Air Conditioning Contractors Association (SMACNA).
f) Integrated Pest Management should be promoted in home and school environments.
g) Purchasing cleaning and construction materials and supplies should reflect efforts to reduce exposures to irritants and allergens.
h) Environmental trigger assessment and remediation programs in homes and schools should be enhanced and coordinated by health providers, state and local health departments, housing/school facility agencies, environmental agencies, and community-based programs.

7. **Improve our understanding of the role that certain occupations play in contributing to the asthma epidemic.** Other studies have found that 15% to 29% of adult asthma is associated with work exposures. The BRFSS survey demonstrated that people with asthma frequently find themselves unable to be employed.
a) Attention to workplace control of chemicals associated with asthma may reduce the burden of adult disease and allow more adults with asthma to remain employed.
b) Occupational exposures should also be considered when examining gender differences in adult prevalence.
c) Further study of teachers and office workers is needed to assess the burden of adult-onset asthma and exacerbations of asthma due to indoor environments.

8. **Improve states' abilities to conduct asthma surveillance in order to better understand prevalence trends, geographic and socio-economic distributions, health care utilization and costs, and whether interventions are working.**
a) Within the parameters established by HIPAA, the state departments of Public Health should have ready access to public and private health data from hospitals, office visits,

schools, pharmacies, health data analytic firms, and insurance payers regarding asthma. This is the only way we will gain a comprehensive picture of the disease.
b) School nurses should have the resources and technology to collect and report key health data on children, including for asthma and obesity.
c) The region should continue its efforts to strive to collect data uniformly, so comparisons can be made to each other and to help us better understand why New England is disproportionately impacted.

9. **Consider how community health is affected when developing transportation, commercial development and housing policies.**
a) Cleaner transportation technologies must be supported. Inefficient, low-mileage vehicles should be discouraged.
b) Sound state and federal policies that promote "Smart Growth" communities, that are walkable and built near public transportation, should be developed and incentivized.
c) Diesel engines should be retrofitted with cleaner technologies and compatible with cleaner gasoline products.
f) Anti-idling laws and guidelines, for both automobiles and buses, require enforcement.

10. **Adopt policies that support quality primary care to prevent asthma severity.**
a) Cost-benefit analyses need to be conducted that demonstrate the health and cost savings of case management approaches to asthma.
b) Our health care system must financially value primary care clinicians, as well as remunerate the more time-consuming case management and educational services that they provide.
c) Insurance plans should put incentives in place for patients to receive well-visits, routine care, and controller medications before expensive urgent care is required.
d) Greater availability of multi-cultural and multi-lingual care is essential.

11. **Launch coordinated information, education and communications strategies and advocacy to promote shared objectives in the region.**
a) States could save money by sharing public service announcements, radio and TV advertisements that could reinforce messages about the importance of, and strategies for, controlling asthma.
b) Training sessions for health care providers on best-practices for asthma management could be offered regionally.
c) Educational certification programs for paraprofessionals could also be offered regionally.
d) Best practices for professional home visiting services should be shared among states.

Finally, the realities of racial, ethnic and socio-economic disparities must be grappled with if we are to improve asthma outcomes in any meaningful fashion. This paradigm is true for most other diseases as well. As long as we continue to focus our resources almost exclusively on finding increasingly expensive medical treatments, but fail to address the structural determinants for why many chronic diseases have become so pervasive, we will fail as a society to protect the health and welfare of all of our citizens, and we will continue our upward spiral toward a system of healthcare that is unaffordable for all of us. While investing in research, prevention and primary care is the key to unlocking the epidemic of asthma, we will not make true progress until we also address the unspoken issues of poverty and race in this country as well.

Appendix A. Glossary

Activity limitation (Adult): Adult reported being limited in any way in any activities due to physical, mental, or emotional problems.
Activity limitation (Child): Child is limited or prevented in any way from doing activities most children the same age can do.
Asthma attack: Child had episode of asthma or attack in past 12 months.
Current asthma (adult): Adult still has asthma (as self-reported)
Current asthma (child): Child still has asthma (as reported by adult respondent).
Depression: Often depressed: Child is usually or always sad, unhappy, or depressed; measure was reported for children ages 6-17 only.
Difficulties: Adult reported that asthma causes moderate to severe health difficulties to child.
ER visit: Visited a hospital Emergency Room for any reason in the past 12 months.
Fair/poor health: Reported fair or poor health as opposed to excellent, good or very good.
Family burden: Respondent reports that a medium to great deal of a burden is placed on the family due to child's asthma.
Frequent mental distress (FMD): Adult reported 14 or more days in the past month when mental health was not good.
Harder to care for: Respondent reports feeling that, in the past month, child with asthma was "usually" or "always" much harder to care for than most children his or her age.
Hospitalization: Child was hospitalized overnight in the past 12 months for asthma.
Lifetime asthma (child or adult): A doctor or other health professional has ever said the child or adult had asthma.
Missed school: Among children in school, number of days in past year that they missed school because of illness or injury.
No leisure time exercise: Adult reported no leisure time physical activity in the past month.
Prescription Medication: Child currently uses or needs medication (not vitamins) prescribed by doctor.
Sacrifice: Respondent said that in past month, they usually or always felt they were giving up more of their life to meet child's needs than ever expected
Sick care visits: Number in past year, excluding hospitalizations, ER visits and well-child care.
Smoking: For children, smoking of cigarettes, pipes, or cigars by anyone in the household. For adults, respondent was a current cigarette smoker; other forms of tobacco or other smokers in the household were not included.
Special services: Child needs special services, equipment, or other care for their health that they can't get from their personal doctor (not asked of those without a personal doctor, but those approximately 14% of children were included as not needing special services).
Therapy: Child needs or gets special therapy such as physical, occupational, or speech, but excluding psychological.
Unable to see MD: Adult was unable to see a doctor when needed in the past year, due to cost.
Unable to work: From demographic employment question, adult respondents who reported they were unable to work.
Uninsured: Child or adult has no health care coverage, including HMO or Medicaid.
Weight categories (Obese, overweight, etc): For all, body mass index (BMI) was determined from reported height and weight. For children, weight categories were determined from percentiles; the 95th percentile means that compared with children of the same age and gender, 95% have a lower BMI. Underweight was defined as less than the 5th percentile, overweight as the 85th to less than the 95th percentile and obese as greater than or equal to the 95th percentile. For adults, overweight was defined as a BMI $\geq$25 and < 30, and obese as a BMI $\geq$30.

Appendix B.

Supplemental Tables: Children

Results (percents and CIs) are weighted values that represent the total population and take into account the complex survey design. The n and N are the actual unweighted number of respondents.

S-1 Lifetime Asthma (New England Children)

Measure		Lifetime asthma			
		Percent	95% CI	N	N
Total		13.9	12.9-14.9	1,577	11,994
Gender					
Males		16.7	15.2-18.2	950	6,147
Females		11.0	9.8-12.4	626	5,836
	P value	<0.0001			
State					
CT		13.7	12.0-15.5	290	2,142
MA		14.6	12.8-16.6	289	2,105
ME		14.6	12.9-16.6	282	1,918
NH		11.6	10.1-13.3	232	1,921
RI		13.9	12.1-15.9	267	2,013
VT		11.4	9.9-13.2	217	1,895
	P value	0.161			
Age (years)					
<5		7.4	5.9-9.2	194	3,141
5-12		15.4	13.9-17.0	717	5,041
13-17		17.2	15.4-19.2	666	3,812
	P value	<0.0001			
Race/Ethnicity					
White (non-H)		12.9	11.9-14.0	1,236	9,765
Black (non-H)		15.8	11.1-22.1	54	343
Hispanic		20.9	17.2-25.1	174	1,063
Other		14.1	9.8-19.9	83	645
	P value	0.0014			
Poverty Status					
<100%		22.2	18.0-27.2	166	892
100-185%		16.7	13.5-20.4	203	1,359
185-300%		12.9	11.0-15.2	301	2,274
>300%		11.8	10.7-13.0	766	6,469
	P value	<0.0001			
Education (highest adult)					
<High school		18.2	12.9-25.0	63	338
HS Grad		17.5	14.9-20.3	333	2,075
Beyond HS		12.5	11.6-13.6	1,178	9,549
	P value	0.0004			

Table S-1 Continued: Lifetime Asthma (New England Children)

	Percent	95% CI	N	N
Family structure				
2 parents	11.8	10.8-12.9	928	8,195
2/1 step	15.7	12.2-19.9	136	807
1 parent (Mom)	19.2	16.7-21.9	412	2,299
Other	16.3	11.3-22.8	75	512
P value	<0.0002			
Smoking in home				
No	13.1	12.0-14.2	991	7,538
Yes	18.8	16.4-21.4	460	2,856
P value	<0.0001			
Adults in home				
1	21.0	17.9-24.6	289	1,515
2	12.0	11.0-13.2	927	8,158
3 or more	15.5	13.4-18.0	359	2,306
P value	<0.0001			
Language in home				
English	13.7	12.7-14.7	1,480	11,251
Other	16.4	12.6-21.2	97	734
P value	0.191			
Weight category				
Underweight	9.1	6.5-12.6	61	664
Normal weight	14.5	13.1-16.0	792	5,754
Overweight	15.4	12.9-18.4	236	1,518
Obese	18.2	15.7-21.1	350	2,006
P value	0.001			

*Lifetime asthma: A doctor or other health professional has ever said the child had asthma.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-2 Current Asthma (New England Children)

Measure		Current Asthma %	95% CI	N	N
Total		9.6	8.8-10.5	1,105	11,945
Gender					
Males		11.4	10.2-12.8	650	6,119
Females		7.7	6.7-8.8	454	5,815
	P value	<0.0001			
State					
CT		8.7	7.4-10.2	194	2,138
MA		10.3	8.8-12.1	205	2,095
ME		10.7	9.2-12.4	201	1,909
NH		8.0	6.8-9.4	160	1,912
RI		10.1	8.6-11.9	197	2,009
VT		8.1	6.8-9.7	148	1,886
	P value	0.087			
Age (years)					
<5		5.1	3.9-6.7	134	3,129
5-12		10.7	9.5-12.1	519	5,022
13-17		11.8	10.3-13.6	452	3,794
	P value	<0.0001			
Race/Ethnicity					
White (non-H)		9.1	8.2-10.0	864	9,721
Black (non-H)		11.3	7.5-16.6	42	342
Hispanic		14.6	11.5-18.4	122	1,062
Other		7.3	4.9-10.7	57	642
	P value	0.003			
Poverty Status					
<100%		15.6	12.2-19.7	128	889
100-185%		11.7	9.1-15.0	144	1,353
185-300%		9.6	7.8-11.7	219	2,268
>300%		7.6	6.7-8.6	513	6,440
	P value	<0.0001			
Education (highest adult)					
<High school		13.0	8.5-19.4	45	338
HS Grad		12.1	9.9-14.6	231	2,067
Beyond HS		8.7	7.9-9.5	828	9,508
	P value	0.005			

Table S-2 Continued: Current Asthma (New England Children)

	Percent	95% CI	N	N
Family structure				
2 parents	8.3	7.4-9.3	646	8,160
2/1 step	10.3	7.5-13.9	92	802
1 parent (Mom)	13.9	11.9-16.3	299	2,291
Other	9.8	6.1-15.4	51	512
P value	<0.0001			
Smoking in home				
No	9.0	8.1-9.9	696	7,507
Yes	13.0	11.1-15.3	319	2,842
P value	0.0002			
Adults in home				
1	14.6	12.1-17.6	202	1,510
2	8.4	7.4-9.4	647	8,124
3 or more	10.6	8.9-12.6	255	2,296
P value	<0.0001			
Language in home				
English	9.7	8.8-10.6	1,047	11,205
Other	9.3	6.4-13.3	58	731
P value	0.838			
Weight category				
Underweight	6.6	4.4-9.9	41	661
Normal weight	10.4	9.2-11.7	565	5,737
Overweight	8.9	7.1-10.9	154	1,507
Obese	13.4	11.2-15.8	258	1,996
P value	0.002			

*Current asthma: A doctor or other health professional has ever said the child had asthma and the respondent indicates the child still has asthma.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-3
New England Children with and without Current Asthma Compared

	Asthma		No asthma		Total		P value
	%	95% CI	%	95% CI	%	95% CI	
Prescription meds	78.9	75.3-82.2	15.3	14.4-16.4	21.5	20.4-22.6	<0.0001
ER visit 12 mo.	33.8	29.4-38.6	19.3	18.1-20.5	20.7	19.6-21.9	<0.0001
Special services	21.0	17.4-25.0	10.9	10.0-11.8	11.8	11.0-12.8	<0.0001
Fair or poor health	10.0	7.1-13.9	1.6	1.2-2.1	2.4	1.9-3.0	<0.0001
Activity limitation	15.3	12.1-19.2	5.2	4.5-6.0	6.1	5.4-6.9	<0.0001
Often depressed	4.6	2.3-8.9	1.6	1.2-2.1	1.9	1.5-2.5	0.004
	Mean	CI	Mean	CI	Total		
Sick care visits	3.4	3.4-3.8	1.7	1.7-1.8	1.9	1.8-2.0	<0.05
Missed school days	5.9	5.2-6.7	3.6	3.5-3.7	3.9	3.7-4.0	<0.05

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4A: Burden of Asthma: New England Children with Asthma

New England Children with Asthma (current)

Asthma episode or attack in past year

State	%	95% CI	n	N
CT	55.5	46.9-63.9	106	193
MA	61.1	53.1-68.5	116	204
ME	64.2	56.3-71.3	122	201
NH	60.1	51.5-68.2	96	160
RI	54.3	45.5-62.8	105	197
VT	56.5	47.0-65.5	83	146
P value	0.521			
Total	59.3	54.9-63.7	628	1,101
Gender				
Male	59.0	53.1-64.6	374	648
Female	59.8	52.8-66.4	253	452
P value	0.859			
Age (years)				
<5	62.2	48.9-73.8	82	133
5-12	64.7	58.5-70.4	317	518
13-17	50.6	43.2-58.1	229	450
P value	0.019			
Race/ethnicity				
White (non-H)	62.2	57.2-66.9	505	862
Black (non-H)	51.5	31.4-71.2	20	42
Hispanic	55.0	42.2-67.1	66	121
Other	43.5	26.0-62.8	25	56
P value	0.25			
Poverty level				
<185%	62.1	53.3-70.1	156	272
185-300	58.9	48.4-68.5	123	218
>300%	59.9	53.5-66.0	300	511
P value	0.868			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4B: Burden of Asthma: New England Children with Asthma

New England Children with Asthma (current)

Moderate/severe difficulties from asthma*

State	%	95% CI	n	N
CT	41.0	32.7-49.9	70	194
MA	35.8	27.9-44.5	61	205
ME	29.0	22.0-37.2	50	201
NH	26.1	19.3-34.3	39	159
RI	37.8	29.7-46.7	69	197
VT	25.8	18.3-35.0	35	147
P value	0.156			
Total	35.4	30.9-40.2	324	1,102
Gender				
Male	35.0	29.2-41.3	192	648
Female	36.1	29.1-43.7	132	454
P value	0.832			
Age (years)				
<5	41.8	28.3-56.7	48	134
5-12	40.8	34.4-47.4	169	518
13-17	25.3	19.1-32.7	107	451
P value	0.01			
Race/ethnicity				
White (non-H)	29.2	24.4-34.6	223	862
Black (non-H)	52.5	32.3-71.9	18	42
Hispanic	54.6	41.9-66.8	63	122
Other	46.4	27.7-66.1	18	57
P value	0.0004			
Poverty level				
<185%	50.7	41.5-60.0	118	271
185-300	30.6	21.7-41.2	60	218
>300%	25.0	19.8-31.2	118	513
P value	<0.0001			

* Adult reported that asthma causes moderate to severe health difficulties to child.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4C: Burden of Asthma: New England Children with Asthma

New England Children with Asthma (current)

Activity Limitation*

State	%	95% CI	n	N
CT	18.4	12.3-26.5	33	194
MA	14.7	9.5-22.0	25	205
ME	17.8	12.3-25.0	33	200
NH	15.0	10.0-21.9	25	160
RI	8.4	4.5-15.3	16	196
VT	13.4	8.1-21.3	19	148
P value	0.43			
Total	15.3	12.1-19.2	151	1,102
Gender				
Male	15.0	10.9-20.3	87	648
Female	15.9	11.3-21.9	64	454
P value	0.797			
Age (years)				
<5	15.5	6.8-31.8	13	134
5-12	18.8	14.0-24.7	86	517
13-17	10.4	7.2-14.9	52	452
P value	0.138			
Race/ethnicity				
White (non-H)	13.7	10.4-17.7	115	862
Black (non-H)	33.6	16.1-57.1	8	42
Hispanic	13.2	6.6-24.7	16	122
Other	13.5	5.7-28.9	10	57
P value	0.046			
Poverty level				
<185%	22.2	15.4-31.0	54	271
185-300	12.0	7.0-19.8	26	219
>300%	9.4	6.5-13.3	57	512
P value	0.002			

* Child is limited or prevented in any way from doing activities most children the same age can do.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4D: Burden of Asthma: New England Children with Asthma

New England Children with Asthma (current)

Fair/poor General Health				
State	%	95% CI	n	N
CT	12.5	7.4-20.3	18	194
MA	11	6.2-18.8	17	205
ME	7.8	4.0-14.7	10	200
NH	5.6	2.9-10.7	10	160
RI	6.8	3.5-12.7	12	197
VT	2.5	0.9-7.2	4	148
P value	0.305			
Total	10	7.1-13.9	71	1,103
Gender				
Male	9.9	6.1-15.6	42	649
Female	10.2	6.3-16.0	29	454
P value	0.932			
Age (years)				
<5	11.3	4.2-27.0	9	134
5-12	11.4	7.5-17.0	39	518
13-17	7.5	3.6-15.2	23	452
P value	0.605			
Race/ethnicity				
White (non-H)	4.3	2.5-7.2	35	863
Black (non-H)	30.9	13.6-56.0	5	42
Hispanic	29.4	18.0-44.1	27	122
Other	7.0	1.2-31.3	2	57
P value	<0.0001			
Poverty level				
<185%	22.9	14.9-33.4	39	272
185-300	5.2	2.5-10.4	10	219
>300%	2.5	1.2-5.2	13	513
P value	<0.0001			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4E: Burden of Asthma: New England Children with Asthma

New England Children with Asthma (current)

Often Depressed (age 6-17)				
State	%	95% CI	n	N
CT	2.8	0.9-8.8	3	159
MA	5.5	1.8-15.6	4	173
ME	5.3	2.0-13.1	6	166
NH	5.0	2.2-10.9	7	140
RI	5.3	2.5-10.9	10	155
VT	0		0	124
P value	0.711			
Total	4.6	2.3-8.9	30	917
Gender				
Male	5.1	2.0-12.7	18	524
Female	3.9	1.8-8.1	12	393
P value	0.655			
Age (years)				
<5				
5-12	3.4	1.2-9.2	12	465
13-17	6.2	2.5-14.5	18	452
P value	0.385			
Race/ethnicity				
White (non-H)	2.8	1.1-6.9	18	727
Black (non-H)	0.9	0.2-4.0	2	33
Hispanic	18.6	7.3-40.0	10	92
Other	0		0	47
P value	0.0006			
Poverty level				
<185%	9.6	3.9-22.1	11	211
185-300	3.0	1.3-6.8	8	182
>300%	0.8	0.4-1.7	9	439
P value	<0.0001			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4F: Burden of Asthma on Family: New England Children with Asthma

New England Children with Asthma (current)

Burden on Family is Moderate or Great

State	%	95% CI	n	N
CT	18.7	12.5-27.1	29	194
MA	16.9	11.0-25.1	30	204
ME	12.3	7.7-19.1	21	201
NH	10.8	6.4-17.6	15	160
RI	13.6	9.1-19.8	30	197
VT	10.1	5.3-18.5	12	147
P value	0.432			
Total	15.9	12.4-20.2	137	1,103
Gender				
Male	15.4	11.2-20.9	82	649
Female	16.6	11.1-24.2	55	453
P value	0.767			
Age (years)				
<5	17.6	7.6-35.4	18	134
5-12	19.9	15.1-25.8	84	517
13-17	9.6	5.2-17.0	35	452
P value	0.107			
Race/ethnicity				
White (non-H)	13.0	9.4-17.5	90	863
Black (non-H)	25.9	11.7-48.1	10	42
Hispanic	29.9	18.2-44.9	31	121
Other	5.5	1.2-21.3	4	57
P value	0.006			
Poverty level				
<185%	27.4	18.9-38.0	58	271
185-300	10.2	6.0-16.8	28	219
>300%	9.9	6.6-14.6	40	512
P value	<0.0001			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4G: Burden of Asthma on Family: New England Children with Asthma

New England Children with Asthma (current)

Harder to Care For*				
State	%	95% CI	n	N
CT	6.2	2.9-12.9	12	193
MA	10.6	6.0-18.0	18	204
ME	10.2	5.9-17.0	16	200
NH	7.4	4.0-13.3	12	160
RI	10.9	6.8-17.1	22	196
VT	2.3	0.8-6.2	5	148
P value	0.355			
Total	9.1	6.4-12.7	85	1,100
Gender				
Male	8.7	5.9-12.7	60	648
Female	9.6	5.1-17.4	25	452
P value	0.79			
Age (years)				
<5	17.2	7.1-35.9	13	133
5-12	9.4	6.0-14.4	43	516
13-17	5.5	3.3-8.9	29	452
P value	0.076			
Race/ethnicity				
White (non-H)	8.7	5.6-13.2	59	863
Black (non-H)	8.7	2.9-23.0	8	40
Hispanic	8.4	4.0-16.9	12	122
Other	8.3	1.8-30.4	3	57
P value	>0.999			
Poverty level				
<185%	15.2	8.8-25.0	30	270
185-300	5.2	2.8-9.6	16	219
>300%	5.3	2.9-9.6	27	512
P value	0.003			

* Respondent reports feeling that, in the past month, child with asthma was “usually” or “always” much harder to care for than most children his or her age.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4H: Burden of Asthma on Family: New England Children with Asthma

New England Children with Asthma (current)

Sacrifice*				
State	%	95% CI	n	N
CT	16.8	11.1-24.5	33	193
MA	15.2	10.0-22.4	28	204
ME	10.5	6.6-16.5	23	201
NH	13.3	8.4-20.6	20	159
RI	19.8	13.8-27.5	41	196
VT	8.5	4.3-16.1	12	147
P value	0.45			
Total	15.1	11.9-18.9	157	1,099
Gender				
Male	14.6	10.5-19.9	92	648
Female	15.8	11.4-21.6	65	451
P value	0.738			
Age (years)				
<5	14.1	7.3-25.4	19	133
5-12	12.4	8.7-17.5	62	517
13-17	19.2	13.5-26.6	76	450
P value	0.2			
Race/ethnicity				
White (non-H)	10.8	8.0-14.4	96	862
Black (non-H)	25.2	11.6-46.3	9	42
Hispanic	34.2	22.4-48.3	41	121
Other	7.4	2.5-20.3	8	56
P value	<0.0001			
Poverty level				
<185%	27.7	19.9-37.2	66	271
185-300	6.6	3.4-12.3	20	219
>300%	9.8	6.7-14.2	57	510
P value	<0.0001			

* Respondent said that in past month, they usually or always felt they were giving up more of their life to meet child's needs than ever expected
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4I: Burden of Asthma: Health Care Utilization
New England Children with Asthma

New England Children with Asthma (current)

Prescription Medications*

State	%	95% CI	n	N
CT	82.0	75.2-87.2	153	194
MA	78.5	71.7-84.0	155	205
ME	80.7	73.9-86.1	158	201
NH	74.8	66.6-81.6	120	160
RI	77.0	68.0-84.0	157	197
VT	73.5	63.9-81.2	112	147
P value	0.602			
Total	78.9	75.3-82.2	854	1,103
Gender				
Male	79.4	74.6-83.5	510	650
Female	78.2	72.3-83.2	344	453
P value	0.743			
Age (years)				
<5	74.0	61.4-83.6	98	134
5-12	80.2	74.9-84.5	418	519
13-17	79.1	73.3-84.0	339	451
P value	0.534			
Race/ethnicity				
White (non-H)	80.1	76.0-83.7	678	863
Black (non-H)	87.4	73.5-94.5	32	42
Hispanic	75.1	63.5-83.9	92	122
Other	59.5	38.3-77.6	41	57
P value	0.05			
Poverty level				
<185%	78.8	71.6-84.7	211	272
185-300	76.9	67.1-84.5	166	219
>300%	80.9	75.7-85.2	405	512
P value	0.715			

* Child currently uses or needs medication (not vitamins) prescribed by doctor.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4J: Burden of Asthma: Health Care Utilization
New England Children with Asthma

New England Children with Asthma (current)

Hospitalized for Asthma Past Year				
State	%	95% CI	n	N
CT	6.3	3.1-12.4	10	194
MA	7.5	3.4-15.6	9	205
ME	0.8	0.1-5.7	1	201
NH	3.8	1.7-8.6	6	160
RI	0.6	0.1-2.9	2	197
VT	1.5	0.5-4.5	3	148
P value	0.075			
Total	5.5	3.2-9.4	31	1,105
Gender				
Male	4.7	2.4-9.0	21	650
Female	6.8	2.9-15.5	10	454
P value	0.496			
Age (years)				
<5	21.3	9.6-41.1	13	134
5-12	4.7	2.4-8.9	13	519
13-17	0.6	0.2-1.8	5	452
P value	<0.0001			
Race/ethnicity				
White (non-H)	2.7	0.9-7.5	13	864
Black (non-H)	23.8	8.9-49.9	5	42
Hispanic	12.6	6.0-24.9	11	122
Other	0.4	0.1-2.8	1	57
P value	<0.001			
Poverty level				
<185%	13.5	6.9-24.8	13	272
185-300	0.9	0.3-3.3	3	219
>300%	2.2	1.0-4.8	11	513
P value	<0.0001			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4K: Burden of Asthma: Health Care Utilization
New England Children with Asthma

New England Children with Asthma (current)

Emergency Room Visit Past Year*				
State	%	95% CI	n	N
CT	30.9	23.6-39.4	56	194
MA	33.8	26.2-42.4	60	204
ME	36.6	29.0-44.9	65	201
NH	29.7	22.5-38.0	48	159
RI	30.9	23.1-40.0	51	196
VT	30.5	22.5-39.8	46	148
P value	0.822			
Total	32.8	28.4-37.4	326	1,102
Gender				
Male	31.6	26.2-37.7	201	649
Female	34.5	27.7-42.1	125	452
P value	0.538			
Age (years)				
<5	49.3	35.8-63.0	63	133
5-12	30.6	24.7-37.2	137	517
13-17	29.5	23.2-36.6	126	452
P value	0.017			
Race/ethnicity				
White (non-H)	31.6	26.7-36.9	254	863
Black (non-H)	41.3	22.5-63.1	13	41
Hispanic	38.6	26.9-51.8	44	121
Other	14.8	5.6-33.5	11	57
P value	0.207			
Poverty level				
<185%	42.0	33.0-51.6	104	271
185-300	32.1	22.5-43.5	66	219
>300%	24.8	19.8-30.6	133	513
P value	0.0071			

* For any reason
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4L: Burden of Asthma: Health Care Utilization
New England Children with Asthma

New England Children with Asthma (current)

Needs/uses Special Services*				
State	%	95% CI	n	N
CT	17.9	12.0-25.9	32	193
MA	22.4	16.4-29.9	46	204
ME	21.8	15.9-29.1	42	201
NH	21.1	15.1-28.8	35	160
RI	21.4	14.3-30.7	35	197
VT	18.0	11.7-26.6	28	148
P value	0.779			
Total	21.0	17.5-25.0	218	1,102
Gender				
Male	20.7	16.2-26.2	125	648
Female	21.4	16.2-27.8	93	454
P value	0.859			
Age (years)				
<5	15.8	8.9-26.4	28	133
5-12	22.7	17.4-29.0	106	518
13-17	20.5	15.4-26.7	84	452
P value	0.462			
Race/ethnicity				
White (non-H)	23.5	19.2-28.3	180	863
Black (non-H)	10.9	3.0-32.5	6	42
Hispanic	15.3	8.2-26.9	21	121
Other	21.6	9.0-43.3	10	57
P value	0.291			
Poverty level				
<185%	26.1	18.9-35.0	67	271
185-300	21.6	14.6-31.0	45	218
>300%	16.2	12.3-21.1	92	513
P value	0.074			

* Child needs special services, equipment, or other care for their health that they can't get from their personal doctor (not asked of those without a personal doctor, but those approximately 14% of children were included as not needing special services).
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-4M: Burden of Asthma: Health Care Utilization
New England Children with Asthma

New England Children with Asthma (current)

Needs or Uses Therapy other than Psychological*

State	%	95% CI	n	N
CT	12.2	7.0-20.4	18	194
MA	8.7	5.3-13.8	20	203
ME	11.4	7.1-17.9	21	201
NH	10.4	6.4-16.4	17	159
RI	10.6	6.5-16.8	22	197
VT	9.7	5.2-17.5	12	148
P value	0.736			
Total	10.1	7.7-13.0	110	1,102
Gender				
Male	11.4	8.3-15.4	76	648
Female	8.1	4.9-13.1	34	453
P value	0.246			
Age (years)				
<5	12.1	5.9-23.1	15	133
5-12	12.9	9.2-17.7	68	517
13-17	5.4	3.2-9.0	27	452
P value	0.03			
Race/ethnicity				
White (non-H)	9.6	7.2-12.8	87	863
Black (non-H)	11.0	3.1-32.3	5	41
Hispanic	10.6	5.1-20.9	12	121
Other	4.3	1.1-15.3	3	57
P value	0.802			
Poverty level				
<185%	12.5	8.0-19.1	39	271
185-300	14.5	8.7-23.4	28	218
>300%	4.3	2.7-6.9	31	513
P value	0.002			

* Child needs or gets special therapy such as physical, occupational, or speech, but excluding psychological.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-5: Lifetime Childhood Asthma by Region

Region	Percent	95% CI	Number	Total
I (New England)	13.9	12.9-14.9	1,577	11,994
II (NY, NJ)	12.8	11.5-14.2	521	4,121
III (DE, DC MD, PA, VA, WV)	12.9	12.0-13.8	1,697	12,710
IV (AL, FL, GA, KY, MS, NC, SC, TN)	13.1	12.4-13.9	1,984	16,268
V (IL, IN, MI, MN, OH, WI)	12.0	11.3-12.7	1,441	12,265
VI (AR, LA, NM, OK, TX)	13.2	12.1-14.4	1,296	10,066
VII (IA, KS, MO, NE)	11.2	10.3-12.1	853	7,879
VIII (CO, MT, ND, SD, UT, WY)	9.4	8.5-10.3	991	10,978
IX (AZ, CA, HI, NV)	12.3	11.0-13.7	1,064	8,204
X (AK, ID, OR, WA)	10.4	9.5-11.5	778	7,650
Total	12.5	12.1-12.8	12,202	102,135
P value	0.001			

Table S-6: Current Childhood Asthma by Region

Region	Percent	95% CI	Number	Total
I (New England)	9.6	8.8-10.5	1,105	11,945
II (NY, NJ)	9.5	8.4-10.8	364	4,102
III (DE, DC MD, PA, VA, WV)	9.1	8.4-9.9	1,246	12,667
IV (AL, FL, GA, KY, MS, NC, SC, TN)	9.4	8.8-10.1	1,410	16,217
V (IL, IN, MI, MN, OH, WI)	9.0	8.4-9.7	1,071	12,233
VI (AR, LA, NM, OK, TX)	9.8	8.8-10.9	900	10,021
VII (IA, KS, MO, NE)	8.4	7.6-9.2	618	7,858
VIII (CO, MT, ND, SD, UT, WY)	7.0	6.2-7.8	729	10,947
IX (AZ, CA, HI, NV)	7.7	6.7-8.9	722	8,163
X (AK, ID, OR, WA)	7.0	6.2-7.9	524	7,625
Total	8.9	8.6-9.2	8,689	101,778
P value	0.0006			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Supplemental Tables: Adults

Results (percents and Cis) are weighted values that represent the total population and take into account the complex survey design. The n and N are the actual unweighted number of respondents.

Table S-7 Lifetime Asthma (New England Adults)

Measure		Lifetime asthma			
		Percent	95% CI	n	N
Total		15.0	14.4-15.5	5,065	33,561
Gender					
Males		12.2	11.4-13.1	1,576	13,314
Females		17.5	16.7-18.3	3,489	20,247
	P value	<0.0001			
State					
CT		15.3	14.3-16.5	917	6,022
MA		14.9	13.9-16.0	1,302	8,182
ME		14.7	13.3-16.2	504	3,527
NH		15.0	13.9-16.3	762	5,056
RI		14.6	13.2-16.0	604	3,993
VT		15.0	14.0-16.1	976	6,781
	P value	0.925			
Age (years)					
18-24		20.7	18.2-23.5	361	1,656
25-34		16.6	15.1-18.2	812	4,492
35-44		14.6	13.5-15.8	1,008	6,719
45-54		14.1	13.1-15.2	1,139	7,412
55-64		14.0	12.8-15.3	843	5,698
65+		11.6	10.5-12.7	847	7,239
	P value	<0.0001			
Race/Ethnicity					
White (non-H)		14.8	14.2-15.4	4,319	29,594
Black (non-H)		16.5	13.2-20.4	156	859
Hispanic		15.9	13.5-18.6	305	1,610
Other		15.8	12.9-19.2	207	1,099
	P value	0.604			
Education					
< High School		16.5	14.4-18.8	501	2,704
High School		14.9	13.8-16.0	1,388	9,530
Some college		15.3	14.2-16.6	1,235	7,941
College grad		14.5	13.7-15.4	1,929	13,313
	P value	0.323			

Table S-7 Continued: Lifetime Asthma (New England Adults)

	Percent	95% CI	n	N
Household Income				
<$25,000	17.8	16.5-19.2	1,389	7,664
$25K-$49,999	14.2	13.1-15.4	1,201	8,373
$50K-$74,999	14.7	13.4-16.1	757	5,467
$75,000+	14.2	13.1-15.3	1,099	7,806
P value 0.0001				
Married				
Yes	13.2	12.5-13.9	2,366	17,659
No	17.4	16.4-18.4	2,673	15,755
P value <0.0001				
Employment				
Employed/self empl	14.4	13.7-15.1	3,026	20,734
Unemployed	18.7	15.6-22.1	290	1,560
Homemaker	15.0	13.1-17.1	340	2,217
Student	20.3	16.6-24.7	152	760
Retired	10.9	9.9-12.1	725	6,507
Unable to work	29.0	25.8-32.4	525	1,716
P value <0.0001				
Smoking status				
Yes	17.7	16.3-19.3	1,061	6,314
No	14.3	13.7-15.0	3,988	27,130
P value <0.0001				
Weight category				
Not overweight	13.7	12.9-14.6	1,812	13,720
Overweight	14.2	13.3-15.2	1,611	11,548
Obese	18.8	17.5-20.2	1,338	6,642
P value <0.0001				

*Lifetime asthma: A doctor or other health professional has ever said the adult had asthma.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-8 Current Asthma (New England Adults)

Measure		Current asthma			
		Percent	95% CI	n	N
Total		9.7	9.2-10.2	3,361	33,410
Gender					
Males		7.1	6.5-7.8	926	13,263
Females		12.0	11.4-12.7	2,435	20,147
	P value	<0.0001			
State					
CT		9.7	8.8-10.7	586	5,984
MA		9.7	8.8-10.5	881	8,148
ME		9.6	8.5-10.9	346	3,509
NH		10.3	9.3-11.3	528	5,041
RI		9.6	8.6-10.8	421	3,980
VT		8.5	7.8-9.3	599	6,748
	P value	0.691			
Age (years)					
18-24		12.5	10.5-14.9	201	1,645
25-34		9.7	8.5-10.9	496	4,467
35-44		9.7	8.8-10.7	676	6,689
45-54		9.5	8.6-10.4	766	7,374
55-64		9.6	8.6-10.8	585	5,681
65+		7.9	7.1-8.9	596	7,209
	P value	0.0003			
Race/Ethnicity					
White (non-H)		9.6	9.1-10.1	2,853	29,465
Black (non-H)		10.7	8.4-13.5	119	854
Hispanic		9.4	7.5-11.7	187	1,602
Other		10.9	8.6-13.7	151	1,094
	P value	0.6630			
Education					
< High School		11.9	10.0-14.0	374	2,687
High School		9.7	8.8-10.6	949	9,486
Some college		10.2	9.2-11.2	834	7,909
College grad		8.9	8.3-9.7	1,193	13,255
	P value	0.0124			

Table S-8 Continued: Current Asthma (New England Adults)

	Percent	95% CI	n	N
Household Income				
<$25,000	12.8	11.7-14.0	1,031	7,631
$25K-$49,999	9.3	8.3-10.3	796	8,334
$50K-$74,999	8.8	7.8-9.9	474	5,447
$75,000+	8.5	7.7-9.4	657	7,770
P value <0.0001				
Married				
Yes	8.4	7.9-9.0	1,522	17,581
No	11.3	10.5-12.2	1,821	15,683
P value <0.0001				
Employment				
Employed/self emp	9.2	8.6-9.8	1,924	20,643
Unemployed	12.0	9.7-14.8	202	1,556
Homemaker	9.2	7.8-10.9	218	2,203
Student	11.3	8.7-14.7	89	750
Retired	7.9	7.0-8.9	522	6,486
Unable to work	20.7	18.0-23.6	402	1,705
P value <0.0001				
Smoking status				
Yes	11.2	10.0-12.6	697	6,279
No	9.3	8.8-9.8	2,655	27,019
P value 0.0036				
Weight category				
Not overweight	8.7	8.0-9.4	1,144	13,659
Overweight	8.9	8.1-9.7	1,027	11,505
Obese	13.1	11.9-14.3	962	6,602
P value <0.0001				

*Current asthma: A doctor or other health professional has ever said the adult had asthma and the adult reports they still have asthma.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-9 New England Adults with and without Current Asthma Compared

	Adults with Asthma		Adults without Asthma		Total		
Measure	%	95% CI	%	95% CI	%	95% CI	P value
Fair or poor health	22.5	20.5-24.7	11.2	10.7-11.8	12.3	11.8-12.8	<0.0001
FMD*	17.2	15.4-19.2	8.9	8.4-9.4	9.7	9.2-10.2	<0.0001
Activities limited	30.7	28.5-33.1	14.7	14.1-15.3	16.2	15.7-16.8	<0.0001
Unable to work	8.6	7.4-9.9	3.5	3.2-3.8	4.0	3.7-4.3	<0.0001
No leisure time exercise	25.1	23.0-27.3	19.4	18.7-20.1	19.9	19.3-20.6	<0.0001
Unable to get needed care	14.2	12.3-16.2	8.4	7.9-8.9	9.0	8.5-9.5	<0.0001
Uninsured	8.8	7.3-10.6	10.4	9.8-11.0	10.3	9.7-10.8	0.0923

*FMD: Frequent mental distress, defined as 14 or more days in the past month when mental health was not good.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-10A: Burden of Asthma: New England Adults with Asthma

New England Adults with Asthma (current)

Fair or Poor Health				
State	%	95% CI	n	N
CT	20.3	16.9-24.2	144	584
MA	21.7	18.2-25.7	248	879
ME	30.0	24.8-35.9	117	345
NH	21.2	17.6-25.4	135	526
RI	25.2	20.7-30.4	125	421
VT	25.7	22.0-29.8	176	598
P value	0.042			
Total	22.5	20.5-24.7	945	3,353
Gender				
Male	20.4	17.2-24.1	248	925
Female	23.6	21.2-26.3	697	2,428
P value	0.15			
Age (years)				
18-44	13.8	11.2-16.9	223	1,373
45-64	28.6	25.4-31.9	438	1,345
65+	41.7	36.0-47.8	273	594
P value	<0.0001			
Race/ethnicity				
White (non-H)	20.7	18.6-22.9	737	2,845
Black (non-H)	16.7	10.6-25.5	28	119
Hispanic	45.4	34.2-57.1	98	187
Other	27.4	18.8-38.1	60	151
P value	<0.0001			
Income				
<$25,000	44.8	40.2-49.5	524	1,029
$25K-49,999	21.6	17.4-26.5	179	795
>$50,000	8.4	6.6-10.8	106	1,129
P value	<0.0001			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-10B: Burden of Asthma: New England Adults with Asthma

New England Adults with Asthma (current)

Frequent Mental Distress*				
State	%	95% CI	n	N
CT	17.5	13.9-21.6	105	580
MA	17.0	13.8-20.7	181	867
ME	19.0	14.7-24.2	69	345
NH	15.1	12.1-18.7	97	519
RI	17.7	13.9-22.3	84	415
VT	18.4	15.0-22.5	114	584
P value	0.85			
Total	17.2	15.4-19.2	650	3,310
Gender				
Male	12.0	9.2-15.5	127	911
Female	20.0	17.7-22.5	523	2,399
P value	0.0003			
Age (years)				
18-44	18.0	15.2-21.4	272	1,357
45-64	18.6	16.0-21.5	292	1,336
65+	10.4	7.8-13.7	76	577
P value	0.005			
Race/ethnicity				
White (non-H)	15.3	13.5-17.3	500	2,814
Black (non-H)	20.4	12.8-30.9	28	119
Hispanic	34.9	23.5-48.4	60	181
Other	23.8	16.2-33.6	50	149
P value	<0.0001			
Income				
<$25,000	31.0	26.8-35.6	332	1,017
$25K-49,999	16.8	13.3-20.9	144	791
>$50,000	7.9	6.0-10.3	99	1,122
P value	<0.0001			

* Adult reported 14 or more days in the past month when mental health was not good.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-10C: Burden of Asthma: New England Adults with Asthma

New England Adults with Asthma (current)

Activity Limitation*

State	%	95% CI	n	N
CT	30.1	25.8-34.8	193	576
MA	30.2	26.3-34.5	295	849
ME	33.9	28.3-39.9	131	339
NH	33.4	28.9-38.2	199	514
RI	26.5	21.8-31.8	130	413
VT	34.8	30.5-39.3	235	586
P value	0.416			
Total	30.7	28.5-33.1	1,183	3,277
Gender				
Male	26.6	22.7-30.9	288	889
Female	32.9	30.2-35.7	895	2,388
P value	0.015			
Age (years)				
18-44	21.5	18.4-24.9	334	1,329
45-64	40.3	36.7-44.1	562	1,329
65+	44.4	38.5-50.4	274	582
P value	<0.0001			
Race/ethnicity				
White (non-H)	30.7	28.3-33.3	982	2,789
Black (non-H)	20.5	13.6-29.7	35	113
Hispanic	31.7	21.4-44.1	72	182
Other	32.7	23.4-43.7	66	146
P value	0.414			
Income				
<$25,000	49.6	44.8-54.4	557	1,007
$25K-49,999	26.8	22.5-31.7	238	771
>$50,000	20.6	17.5-24.2	233	1,117
P value	<0.0001			

* Adult reported being limited in any way in any activities due to physical, mental, or emotional problems.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-10D: Burden of Asthma: New England Adults with Asthma

New England Adults with Asthma (current)

Unable to Work				
State	%	95% CI	n	N
CT	7.8	5.6-10.7	56	586
MA	8.4	6.5-10.8	114	880
ME	11.5	8.4-15.5	51	346
NH	7.6	5.5-10.3	51	526
RI	8.9	6.4-12.2	52	420
VT	9.9	7.7-12.6	78	599
P value	0.421			
Total	8.6	7.4-9.9	402	3,357
Gender				
Male	5.9	4.2-8.3	78	924
Female	10.0	8.5-11.6	324	2,433
P value	0.005			
Age (years)				
18-44	5.5	4.1-7.4	104	1,372
45-64	14.8	12.4-17.5	240	1,348
65+	6.3	4.4-8.9	52	596
P value	<0.0001			
Race/ethnicity				
White (non-H)	7.4	6.3-8.7	296	2,850
Black (non-H)	13.5	7.9-22.0	21	119
Hispanic	17.8	10.9-27.7	47	186
Other	12.1	7.3-19.2	30	151
P value	0.0003			
Income				
<$25,000	24.3	20.6-28.3	290	1,031
$25K-49,999	4.5	3.0-6.7	38	796
>$50,000	1.2	0.6-2.1	19	1,130
P value	<0.0001			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-10E: Burden of Asthma: New England Adults with Asthma

New England Adults with Asthma (current)

Uninsured				
State	%	95% CI	n	N
CT	9.5	6.4-13.8	37	585
MA	7.9	5.5-11.2	67	881
ME	5.3	3.1-8.8	18	346
NH	13.5	9.8-18.2	57	527
RI	9.4	6.2-14.1	34	420
VT	11.4	8.5-15.0	56	598
P value	0.106			
Total	8.8	7.3-10.6	269	3,357
Gender				
Male	9.5	6.7-13.2	86	924
Female	8.5	6.8-10.5	183	2,433
P value	0.582			
Age (years)				
18-44	12.3	9.7-15.4	161	1,371
45-64	6.5	4.9-8.5	98	1,351
65+	1.7	0.6-4.4	8	595
P value	<0.0001			
Race/ethnicity				
White (non-H)	8.0	6.4-9.9	208	2,851
Black (non-H)	18.0	9.5-31.7	14	119
Hispanic	16.0	9.1-26.6	25	186
Other	6.9	3.4-13.6	17	151
P value	0.008			
Income				
<$25,000	16.1	12.4-20.6	133	1,031
$25K-49,999	12.1	8.5-17.1	81	796
>$50,000	3.1	1.8-5.3	27	1,130
P value	<0.0001			

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-10F: Burden of Asthma: New England Adults with Asthma

New England Adults with Asthma (current)

Unable to See MD When Needed*

State	%	95% CI	n	N
CT	16.4	12.5-21.1	75	585
MA	12.6	9.7-16.2	107	877
ME	13.4	9.9-17.8	53	346
NH	15.6	11.9-20.2	80	526
RI	14.1	10.4-18.8	64	421
VT	17.4	13.9-21.6	94	596
P value	0.354			
Total	14.2	12.3-16.2	473	3,351
Gender				
Male	13.4	10.1-17.4	114	922
Female	14.6	12.5-16.9	359	2,429
P value	0.575			
Age (years)				
18-44	17.0	14.1-20.3	245	1,370
45-64	13.2	10.9-16.0	181	1,345
65+	6.5	4.1-10.1	44	595
P value	0.0001			
Race/ethnicity				
White (non-H)	12.9	11.1-15.1	362	2,847
Black (non-H)	23.3	13.8-36.5	27	119
Hispanic	19.3	12.0-29.7	36	185
Other	20.4	11.7-33.2	36	150
P value	0.044			
Income				
<$25,000	26.6	22.3-31.4	251	1,029
$25K-49,999	17.3	13.2-22.4	126	795
>$50,000	5.3	3.7-7.6	60	1,130
P value	<0.0001			

* Was unable to see a doctor when needed in the past year, due to cost.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-11 Perceived Illness from indoor air (New England Adults)

Measure		Perceived Illness from indoor air pollution			
		Percent	95% CI	n	N
Total		20.7	20.0-21.4	6,718	33,144
Gender					
Males		17.6	16.6-18.6	2,150	13,148
Females		23.6	22.7-24.5	4,568	19,996
	P value	<0.0001			
State					
CT		22.6	21.4-23.9	1,360	5,928
MA		19.9	18.7-21.2	1,615	8,074
ME		19.9	18.3-21.5	677	3,498
NH		21.6	20.2-23.0	1,024	4,996
RI		20.9	19.3-22.6	822	3,950
VT		18.3	17.2-19.4	1,220	6,698
	P value	0.0015			
Age (years)					
18-24		28.1	25.1-31.3	437	1,642
25-34		23.2	21.4-25.0	1,053	4,458
35-44		22.3	20.9-23.7	1,568	6,617
45-54		23.2	21.9-24.6	1,799	7,337
55-64		18.0	16.6-19.4	1,054	5,613
65+		10.9	9.9-11.9	731	7,136
	P value	<0.0001			
Race/Ethnicity					
White (non-H)		20.6	19.9-21.4	5,856	29,237
Black (non-H)		27.2	23.0-31.9	236	847
Hispanic		18.3	15.4-21.5	284	1,588
Other		22.3	18.7-26.4	264	1,084
	P value	0.0066			
Education					
< High School		18.4	15.9-21.1	433	2,653
High School		19.8	18.6-21.1	1,763	9,425
Some college		23.1	21.7-24.5	1,789	7,836
College grad		20.4	19.4-21.5	2,724	13,158
	P value	0.0014			

Table S-11 Continued: Perceived Illness from indoor air (New England Adults)

	Percent	95% CI	n	N
Household Income				
<$25,000	22.3	20.7-24.0	1,593	7,560
$25K-$49,999	22.5	21.0-23.9	1,787	8,270
$50K-$74,999	20.9	19.4-22.6	1,141	5,412
$75,000+	19.8	18.6-21.1	1,507	7,737
P value	0.0235			
Married				
Yes	18.5	17.7-19.3	3,245	17,469
No	23.8	22.6-25.0	3,438	15,530
P value	<0.0001			
Employment				
Employed/self emp	22.1	21.3-23.0	4,576	20,491
Unemployed	24.0	20.8-27.5	373	1,539
Homemaker	16.9	14.8-19.1	370	2,189
Student	26.9	22.3-32.0	200	753
Retired	11.3	10.3-12.5	709	6,429
Unable to work	30.0	26.5-33.7	473	1,677
P value	<0.0001			
Smoking status				
Yes	24.3	22.7-26.1	1,492	6,236
No	19.9	19.1-20.6	5,203	26,795
P value	<0.0001			
Weight category				
Not overweight	20.7	19.6-21.8	2,683	13,568
Overweight	19.1	18.0-20.3	2,088	11,410
Obese	23.6	22.1-25.2	1,561	6,546
P value	<0.0001			

* Respondent reported an illness or symptoms in the past 12 months that they thought was caused by something in the air inside a home, office, or other building.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-12 Perceived Illness from outdoor air pollution (New England Adults)

Measure		Perceived Illness from outdoor air pollution			
		Percent	95% CI	n	N
Total		9.1	8.6-9.6	3,087	33,121
Gender					
Males		7.2	6.6-7.9	961	13,117
Females		10.8	10.2-11.5	2,126	20,004
	P value	<0.0001			
State					
CT		11.0	10.1-12.0	689	5,908
MA		8.7	7.9-9.5	775	8,065
ME		7.8	6.8-8.9	295	3,494
NH		8.5	7.6-9.5	454	5,006
RI		9.3	8.2-10.4	396	3,936
VT		6.5	5.9-7.2	478	6,712
	P value	<0.0001			
Age (years)					
18-24		9.4	7.5-11.7	136	1,634
25-34		8.7	7.5-10.0	384	4,457
35-44		8.7	7.8-9.7	574	6,631
45-54		10.4	9.5-11.3	840	7,324
55-64		9.3	8.3-10.4	550	5,601
65+		8.0	7.1-8.9	554	7,135
	P value	0.1027			
Race/Ethnicity					
White (non-H)		8.8	8.3-9.3	2,633	29,241
Black (non-H)		13.2	10.1-17.0	124	842
Hispanic		9.1	7.2-11.5	158	1,570
Other		10.6	8.0-13.9	127	1,078
	P value	0.0245			
Education					
< High School		9.9	8.3-11.8	272	2,642
High School		8.7	7.9-9.6	815	9,386
Some college		10.0	9.1-11.1	822	7,864
College grad		8.7	7.9-9.4	1,173	13,159
	P value	0.0780			

Table S-12 Continued: Ill from outdoor air pollution (New England Adults)

		Percent	95% CI	n	N
Household Income					
<$25,000		13.2	12.0-14.6	957	7,539
$25K-$49,999		9.6	8.6-10.6	754	8,259
$50K-$74,999		7.8	6.9-8.9	436	5,418
$75,000+		7.2	6.4-8.0	562	7,750
	P value	<0.0001			
Married					
Yes		7.8	7.3-8.3	1,407	17,463
No		10.9	10.0-11.7	1,655	15,513
	P value	<0.0001			
Employment					
Employed/self emp		8.3	7.8-8.9	1,769	20,496
Unemployed		11.3	9.2-13.9	201	1,536
Homemaker		8.2	6.9-9.8	178	2,192
Student		11.1	7.9-15.3	78	753
Retired		8.4	7.5-9.4	517	6,410
Unable to work		20.8	17.9-24.0	339	1,670
	P value	<0.0001			
Smoking status					
Yes		9.9	8.8-11.1	646	6,215
No		8.9	8.4-9.4	2,432	26,791
	P value	0.108			
Weight category					
Not overweight		9.0	8.2-9.8	1,177	13,542
Overweight		8.1	7.4-8.9	969	11,401
Obese		10.6	9.6-11.8	741	6,554
	P value	0.001			

* Respondent reported an illness or symptoms in the past 12 months that they thought was caused by pollution in the air outdoors.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-13: Lifetime Adult Asthma by Region

Region	Percent	95% CI	Number	Total
I (New England)	15.0	14.4-15.6	5,065	33,561
II (NY, NJ)	14.0	13.2-14.8	2,430	17,867
III (DE, DC MD, PA, VA, WV)	13.5	12.9-14.2	3,642	26,569
IV (AL, FL, GA, KY, MS, NC, SC, TN)	12.9	12.4-13.4	6,935	53,597
V (IL, IN, MI, MN, OH, WI)	12.8	12.2-13.3	4,212	31,698
VI (AR, LA, NM, OK, TX)	12.8	12.1-13.5	4,262	32,683
VII (IA, KS, MO, NE)	12.1	11.5-12.8	3,120	27,424
VIII (CO, MT, ND, SD, UT, WY)	12.9	12.3-13.6	3,661	29,467
IX (AZ, CA, HI, NV)	13.7	12.7-14.8	1,645	12,096
X (AK, ID, OR, WA)	15.3	14.8-15.9	4,814	31,535
Total	13.3	13.1-13.6	39,786	296,497
P value	0.0001			

Table S-14: Current Adult Asthma by Region

Region	Percent	95% CI	Number	Total
I (New England)	9.7	9.2-10.2	3,361	33,410
II (NY, NJ)	8.8	8.2-9.5	1,596	17,809
III (DE, DC MD, PA, VA, WV)	8.4	7.9-8.9	2,364	26,463
IV (AL, FL, GA, KY, MS, NC, SC, TN)	7.7	7.4-8.1	4,406	53,408
V (IL, IN, MI, MN, OH, WI)	8.3	7.9-8.8	2,864	31,572
VI (AR, LA, NM, OK, TX)	7.3	6.8-7.8	2,594	32,535
VII (IA, KS, MO, NE)	7.9	7.4-8.5	2,077	27,357
VIII (CO, MT, ND, SD, UT, WY)	8.3	7.7-8.8	2,439	29,362
IX (AZ, CA, HI, NV)	7.6	6.8-8.4	982	12,062
X (AK, ID, OR, WA)	9.2	8.7-9.6	3,061	31,355
Total	8.1	7.9-8.3	25,744	295,333
P value	<0.0001			

Note: HI data were missing for Region IX for the BRFSS.

95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

Table S-15: Perceived Illness from Indoor Air by Region

Region	Percent	95% CI	Number	Total
I (New England)	20.7	20.0-21.4	6,718	33,144
II (NY, NJ)	22.7	21.7-23.7	3,867	17,639
III (DE, DC MD, PA, VA, WV)	21.5	20.8-22.3	5,736	26,231
IV (AL, FL, GA, KY, MS, NC, SC, TN)	21.1	20.5-21.7	10,735	52,790
V (IL, IN, MI, MN, OH, WI)	22.0	21.3-22.8	6,849	31,257
VI (AR, LA, NM, OK, TX)	24.2	23.3-25.0	7,560	32,247
VII (IA, KS, MO, NE)	21.0	20.1-21.8	5,215	27,142
VIII (CO, MT, ND, SD, UT, WY)	19.5	18.7-20.2	5,606	29,166
IX (AZ, CA, HI, NV)	20.8	19.6-22.0	2,572	12,005
X (AK, ID, OR, WA)	22.7	22.0-23.3	6,907	31,114
Total	21.7	21.4-22.0	61,765	292,735
P value	<0.0001			

Table S-16: Perceived Illness from Outdoor Air Pollution by Region

Region	Percent	95% CI	Number	Total
I (New England)	9.1	8.6-9.6	3,087	33,121
II (NY, NJ)	12.9	12.1-13.7	2,180	17,600
III (DE, DC MD, PA, VA, WV)	10.3	9.8-10.9	3,051	26,207
IV (AL, FL, GA, KY, MS, NC, SC, TN)	12.9	12.4-13.4	6,831	52,766
V (IL, IN, MI, MN, OH, WI)	9.7	9.2-10.2	3,206	31,231
VI (AR, LA, NM, OK, TX)	15.5	14.7-16.3	4,687	32,190
VII (IA, KS, MO, NE)	8.7	8.2-9.3	2,350	27,209
VIII (CO, MT, ND, SD, UT, WY)	12.9	12.3-13.6	3,372	29,267
IX (AZ, CA, HI, NV)	19.3	18.1-20.5	2,271	11,982
X (AK, ID, OR, WA)	13.2	12.7-13.7	4,254	31,155
Total	13.0	12.7-13.2	35,289	292,728
P value	<0.0001			

Note: HI data were missing for Region IX for the BRFSS.
95% CI (confidence interval): range of values within which the true population prevalence would be expected to fall in 95 out of 100 samples taken from the population.
P value <0.05 indicates significant association.

C. Technical Notes

Methods

1. Children

Data for children ages 17 and younger are from the National Survey of Children's Health, 2003,[16] a random digit dialed telephone survey conducted as part of the State and Local Area Integrated Telephone Survey (SLAITS) by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC). Interviews were conducted with the parent or guardian who knew the most about the health of one child who was randomly selected from among the children in households with any children in the 50 states and the District of Columbia. Between January 2003 and July 2004, a total of 102,353 interviews were completed, including 12,026 in the six New England states, or about 2,000 per state. Because 87% of the interviews were conducted during 2003, the survey is referred to as "2003".

The questionnaire was developed by an Expert Panel using existing questions from other surveys wherever possible. The survey was implemented as part of the National Immunization Survey, which collects information on the immunizations received by children 19-35 months old. Advance letters were mailed where possible, and interviews were conducted in either English or Spanish, using a computer assisted telephone interviewing (CATI) system. Cash incentives were offered during part of the survey implementation to increase response rates. Sample weights were created to adjust for different probabilities of selection and for non-response, and further adjusted to match the total number of children in each state for 2003. An adjustment based on the number of households with interrupted phone services was used to compensate for households without telephones. And lastly, selected edits were made to the final data file to reduce the possibility of identifying a single respondent.

Data and supporting documentation used for this report were obtained from the National Center for Health Statistics website (http://www.cdc.gov/nchs/). Any analysis, data interpretations or conclusions reached in this report are the responsibility of ARC and not the NCHS, which is responsible only for providing the data.

2. Adults

The 2004 Behavioral Risk Factor Surveillance System (BRFSS) was the source of data for adults ages 18 and older. The BRFSS is a state-based telephone survey of randomly-selected non-institutionalized adults age 18 and older. It is conducted cooperatively by the states and the Centers for Disease Control and Prevention (CDC). The survey collects data on risk factors, chronic conditions, and use of preventive health services related to the leading causes of death and disability. In most years all 50 states, the District of Columbia (DC), and some territories participate, but Hawaii did not collect data in 2004. The data analyzed for this report include 49 states and the District of Columbia for a total of 296,970 interviews, with a total of 33,618 conducted in the six New England states. All results were adjusted for the

number of residential telephones and the number of adults in each household to account for the probability of selection. Results were further adjusted to represent the adult population in each state, using weights for each respondent provided by CDC. This adjustment accounts for the fact that the distribution of the sample of persons interviewed is not the same as the composition of the state population by age and gender.

3. Analysis

All analyses were conducted using Stata software (Version 8.0, Stata Corp, College Station, TX) which takes into account the complex sample design of both surveys. In the case of the NCHS children's data, the guidelines for data analysis were followed, and the sample results provided with the data set were confirmed, indicating that the proper sample weights and methods were being used. Demographic characteristics of children and adults surveyed are shown in Tables D-1 and D-2 on pages 77-78. Survey results (weighted percents and/or means and 95% confidence intervals along with the unweighted sample sizes) are presented in Supplemental Tables on pages 37-73. The *95% confidence interval,* or margin of error, defines the range of values within which the true population prevalence rate would be expected to fall in 95 out of 100 samples taken from the population. Respondents with missing values ("don't know" or "refused") were excluded from analysis of that variable, unless otherwise noted.

4. Limitations

All estimates obtained from survey data are subject to errors and these results are no exception. Measurement error may occur from survey inconsistencies, such as different interviewers reading a question in a slightly different manner. Non-response error is introduced when respondents refuse to answer, and recall error occurs when their memory of past events is inaccurate.

Another limitation is that these data are from phone surveys, and thus the homeless, persons in households without phones (or with only cell phones), and certain disabled persons are not represented. Phone coverage may be an issue for deriving accurate estimates among lower income persons, certain demographic groups, or when the item of interest is likely to be much higher among those with no phones (such as lack of health insurance). College students living in dormitories, incarcerated persons, and adults in nursing homes are also not included in the sample. Declining response rates for telephone surveys are another concern. BRFSS response rates in general have declined from about 70% ten years ago to about 50% or less in recent years. When response rates decline, the danger is that the persons who respond may differ from those that are unwilling to participate. Also, it should be noted that because the results are weighted to the population of each state, Massachusetts and Connecticut residents make up about 70% of the responses.

In making comparisons between New England and the rest of the United States and among the ten Health and Human Services Regions, rates were not age adjusted. Age specific rates were used however in the comparisons between New England and the rest of the US. Small sample sizes for non-white adults and children hampered our ability to interpret results for race and ethnicity. And grouping Hispanics into a single category may be masking high and low rates among certain ethnic groups, such as Mexicans or Puerto Ricans.

Table D-1

Demographics of Children: National Survey of Children's Health, 2003

	Weighted Percent	N		Weighted Percent	N
Total	100.0	12,026	**Highest education (adult)**		
Sex			<High School	4.5	340
Male	51.1	6,165	H S grad	23.0	2,082
Female	48.9	5,850	>High School	72.5	9,572
State			**Family structure**		
CT	25.3	2,146	2 Parents	68.3	8,212
MA	45.1	2,114	2; 1 Step-parent	6.7	811
ME	8.7	1,920	1/Mom only	21.1	2,306
NH	9.3	1,925	Other	3.9	514
RI	7.4	2,019			
VT	4.2	1,902	**Smoker in home**		
			No	72.3	7,559
Age (years)			Yes	27.7	2,864
<5	25.6	3,153			
5-12	45.3	5,055	**# adults**		
13-17	29.1	3,818	1	14.5	1,518
			2	69.5	8,183
Race/ethnicity			3 or more	16.0	2,310
White	78.1	9,789			
Black	6.2	343	**Language**		
Hispanic	9.7	1,070	English	92.2	11,280
Other	6.0	646	Other	7.8	737
Poverty status			**Weight category**		
<100%	10.5	895	Underweight	7.4	664
100-185%	13.7	1,365	Normal weight	56.8	5,772
185-300%	20.2	2,277	Overweight	15.3	1,519
>300%	55.5	6,486	Obese	20.5	2,007

The weighted response rate for the child survey was 55.3%.

Table D-2

Demographics of Adults: 2004 Behavioral Risk Factor Surveillance System

	Weighted Percent	N
Total	100.0	33,618
Sex		
Male	47.6	13,332
Female	52.4	20,286
State		
CT	23.9	6,030
MA	45.6	8,203
ME	9.4	3,530
NH	9.0	5,065
RI	7.7	3,999
VT	4.4	6,791
Age (years)		
18-24	12.0	1,660
25-34	17.0	4,499
35-44	21.3	6,725
45-54	18.7	7,427
55-64	13.2	5,706
65+	17.9	7,254
Race/ethnicity		
White	86.3	29,639
Black	3.2	862
Hispanic	6.4	1,614
Other	4.0	1,103

	Weighted Percent	N
Education		
<High School	7.9	2,710
H S grad	26.8	9,544
Some college	24.2	7,955
College grad	41.1	13,336
Income		
<$25,000	21.5	7,683
$25K-$49,999	26.0	8,382
$50K-$74,999	19.1	5,475
$75,000+	33.4	7,820
Married		
Yes	58.0	17,685
No	42.0	15,785
Smoker		
Yes	19.2	6,323
No	80.8	27,176
Weight category		
Not overweight	44.1	13,740
Overweight	36.4	11,565
Obese	19.5	6,659

Table E. State Rankings of Current Asthma Prevalence

	Current Asthma – Children[1]		Current Asthma – Adults[2]	
Rank	State	Percent	State	Percent
1	DE	11.9	NH	10.3
2	HI	11.9	WV	10.1
3	DC	11.8	DE	10.0
4	WV	11.1	CT	9.7
5	IN	10.9	MA	9.7
6	LA	10.7	OR	9.7
7	ME	10.7	ME	9.6
8	KS	10.6	RI	9.6
9	MD	10.4	NM	9.3
10	MA	10.3	DC	9.2
11	KY	10.2	WA	9.2
12	MI	10.1	MO	9.1
13	RI	10.1	AK	9.0
14	NY	10.0	TN	9.0
15	OH	10.0	NY	8.9
16	TX	10.0	PA	8.8
17	AL	9.6	CO	8.7
18	GA	9.6	AL	8.6
19	FL	9.5	MT	8.6
20	SC	9.3	NJ	8.6
21	OK	9.2	WI	8.6
22	MS	9.1	OH	8.5
23	NC	9.0	VT	8.5
24	NM	8.9	IL	8.4
25	CT	8.7	IN	8.4
26	MO	8.7	KY	8.3
27	WI	8.7	MI	8.3
28	AZ	8.6	OK	8.3
29	TN	8.6	ID	8.0
30	NJ	8.5	UT	8.0
31	PA	8.4	MD	7.8
32	VA	8.4	CA	7.7
33	AK	8.3	ND	7.7
34	AR	8.3	WY	7.7
35	VT	8.1	SC	7.6
36	NH	7.9	MN	7.5
37	CO	7.7	NC	7.5
38	IL	7.6	AR	7.4
39	CA	7.5	GA	7.4
40	WA	7.4	KS	7.4
41	MT	7.1	FL	7.3
42	NV	7.0	VA	7.3
43	NE	6.8	AZ	7.2
44	IA	6.6	MS	7.1
45	ND	6.6	NV	7.1
46	OR	6.5	TX	7.1
47	WY	6.5	NE	6.9
48	MN	6.2	SD	6.7
49	UT	6.2	IA	6.6
50	SD	5.8	LA	6.2
51	ID	5.7		HI. data not collected

New England states highlighted Source: National Survey of Children's Health 2003
Source: 2004 Behavioral Risk Factor Surveillance System

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