
Asthma in New Hampshire

1990-2004



New Hampshire Department of Health and Human Services
Division of Public Health Services
Bureau of Prevention Services
Asthma Control Program

Asthma in New Hampshire, 1990-2004

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REPORT FINDINGS

ASTHMA PREVALENCE AND CONTROL

- ❖ Approximately 149,000 adults (15%) were told by a health professional that they had asthma; about 102,000 adults (10.3%) have current asthma in New Hampshire.
- ❖ The prevalence of both lifetime and current asthma has increased almost every year since 2000.
- ❖ Adult females were more likely to report current asthma (12.2%) than adult males (9.3%) in New Hampshire and nationally.
- ❖ The prevalence of current asthma among females has increased every year from 2000-2004. The prevalence of current asthma among males decreased slightly from 2001 to 2003.
- ❖ Adult males were most likely to be diagnosed with asthma as a child less than 10 years old. Adult females were most likely to be diagnosed with asthma as an adult between the ages of 18-44.
- ❖ Almost half (47.5%) of New Hampshire adults with asthma reported they had asthma symptoms at least once a week, 48% reported no routine check-up for asthma in the past year, 25% reported an unscheduled doctor visit, and 61% reported not being immunized against influenza.
- ❖ Approximately 22.9% of adults with asthma also reported being current smokers and 28.6% were obese.
- ❖ In 2003, approximately 24,000 children under age 18 (7.9 %) had current asthma in New Hampshire.

INPATIENT HOSPITALIZATIONS FOR ASTHMA

- ❖ There were 940 asthma hospitalizations of New Hampshire residents in 2004, a rate of 7.2 per 10,000 residents. These hospitalizations resulted in 3,317 days spent in the hospital and charges of approximately 8.2 million dollars- almost double the amount spent in 2000.
- ❖ The median charge per asthma hospitalization was \$5,246 and average length of stay was 3.5 in 2004.

- ❖ Children less than 5 years of age and adults 65 years and older had the highest rates of hospitalization for asthma in 2004.
- ❖ The hospitalization rate for females in 2004 was 9.0 per 10,000 residents, compared to 5.2 per 10,000 male residents. Female rates were consistently higher than male rates from 1996-2004.
- ❖ The likelihood of hospitalization for asthma varied by both age and gender. Males aged 0 to 14 had higher hospitalization rates than females; after age 14, females had higher rates.
- ❖ The number of hospitalizations for asthma in New Hampshire varied by season. July and August had the lowest number of hospitalizations due to asthma, with a dramatic rise in hospitalizations from August to September.

EMERGENCY DEPARTMENT VISITS FOR ASTHMA

- ❖ There were 5,498 asthma emergency department visits by New Hampshire residents in 2004, a rate of 42.3 per 10,000 residents. These visits resulted in approximately 3.9 million dollars in charges. Charges for emergency department visits for asthma in New Hampshire have increased by 36% or a million dollars since 2001. The median charge per visit was \$581.
- ❖ The rate of asthma emergency department visits among New Hampshire females was 48.7 per 10,000 residents compared to 38.2 per 10,000 male residents in 2004.
- ❖ Children less than 5 years of age and individuals aged 15-34 had the highest rates of asthma emergency department visits in 2004.

MORTALITY DUE TO ASTHMA

- ❖ There were 16 deaths among New Hampshire residents due to asthma in 2002. Approximately two-thirds of all asthma deaths from 1990-2002 were among females.

ASTHMA PREVALENCE AND TOBACCO SMOKE EXPOSURE AMONG MIDDLE AND HIGH SCHOOL STUDENTS

- ❖ Approximately 4,820 middle school students (11.9%) and 10,240 high school students (13.5%) reported having current asthma in 2004.
- ❖ Male middle school students had a higher prevalence of asthma than female middle school students. However, among high school students, females had a higher prevalence than males.

- ❖ Both middle and high school students with asthma were as likely to have tried smoking as those without asthma.
- ❖ Both middle and high school students with asthma were as likely to report being exposed to secondhand smoke as those without asthma.
- ❖ Approximately 2/3 of both middle and high school students report rules at home about not smoking inside the home.

MEDICAID DATA

- ❖ Approximately 10.2% of Medicaid members had asthma and 8.2% had persistent asthma in 2004.
- ❖ There was a greater percent of persistent asthma with increasing age. The percentage of persistent asthma among children with asthma 0-4 years old was 59.8%; the percentage among adults 65 years and older was 97.2%.
- ❖ The prevalence of persistent asthma was higher among females (8.9%) than males (7.2%).
- ❖ Adult females 35-64 years had the highest prevalence of asthma (20.0%).
- ❖ Only 60% of Medicaid members with persistent asthma were appropriately medicated in 2004.

INTRODUCTION

Asthma is a chronic respiratory disease characterized by reversible obstruction of the airways, airway inflammation, and airway hyper-responsiveness to a variety of stimuli. Nationally, asthma is the 2nd most common chronic disease of childhood.¹ The prevalence of self-reported asthma in the United States increased almost 74%, from 31.4 per 1,000 in 1980 to 54.6 per 1,000 in 1996 (when the National Health Interview Survey changed its questions on asthma).² According to data from the 2004 Behavioral Risk Factor Surveillance System (BRFSS), an estimated 17.8 million (8.1%) adults in the United States reported that they currently had asthma.

Due to the large number of people affected, asthma results in considerable economic and social burden on the population. The burden of disease is not evenly distributed across geographic regions or population subgroups: women, children, African-Americans, and residents of urban areas are disproportionately affected by asthma. In 2000, asthma accounted for an estimated 18.3 billion dollars in expenditures in the US.³ The estimated total cost of asthma in New Hampshire in 1998 was 46 million dollars.⁴

Most of the morbidity and mortality from asthma can be prevented if the disease is managed according to established guidelines. Effective management includes control of exposure to factors that trigger exacerbations, adequate pharmacological management, ongoing monitoring of the disease, and patient education.⁵

In October 2001, the Centers for Disease Control and Prevention (CDC) awarded a three-year planning grant to the New Hampshire Department of Health and Human Services to establish an Asthma Control Program. CDC awarded a second three-year grant in September 2004 to implement activities based on recommendations from the state asthma plan developed during the first grant period. Specific goals for the program are to:

- ❖ Strengthen program organizational structure and collaborative partnerships
- ❖ Improve health outcomes by increasing adherence to National Asthma Education and Prevention Program Guidelines
- ❖ Increase capacity to create asthma-healthy environments
- ❖ Enhance public awareness and education
- ❖ Enhance the asthma surveillance system to support program planning, monitoring, and evaluation

This document is the third compilation of data on asthma in New Hampshire. The report is organized into six sections:

- ❖ Asthma prevalence and control data for 2000-2004 from the New Hampshire Behavioral Risk Factor Surveillance System (BRFSS) and the 2003 National Children's Health Survey
- ❖ Hospitalization data for 1996-2004 from the New Hampshire Inpatient Hospital Discharge Data set
- ❖ Emergency department visit data for 1996-2004 from the New Hampshire Outpatient Hospital Discharge Data set

- ❖ Mortality data for 1990-2002 from the New Hampshire Bureau of Vital Records and CDC WONDER
- ❖ Asthma prevalence and tobacco smoke exposure among middle and high school students from the New Hampshire Youth Tobacco Survey (YTS)
- ❖ Prevalence of asthma and use of medical services for the New Hampshire Medicaid population from Medicaid Claims Data, 2001-2004

These data may be used to document the magnitude of the public health problem, assess trends over time, detect changes in health care practices, evaluate control strategies, and facilitate planning.

New Information in This Report

- ❖ Asthma prevalence data for adults from the Behavioral Risk Factor Surveillance System (BRFSS) from 2000-2004.
- ❖ Asthma prevalence data for children from the 2003 National Children's Health Survey.
- ❖ Data on emergency department visits and inpatient hospitalizations 2002-2004.
- ❖ Maps of emergency department discharge rates and hospitalizations for asthma by county.
- ❖ Deaths due to asthma for 2002.
- ❖ Asthma Prevalence data for middle and high school students from the Youth Tobacco Survey for 2004.
- ❖ Prevalence of persistent and all asthma among New Hampshire's Medicaid population from 2001-2004.

FREQUENTLY ASKED QUESTIONS

Why are data not presented by race or ethnicity?

Based on the 2000 United States Census, New Hampshire's population is approximately 96.0% white, 1.3% Asian, 0.7% African American, 0.2% American Indian, 0.6% persons reporting some other race, and 1.1% reporting multiple races. About 1.7% of the population is of Hispanic or Latino origin. Because the percent of racial and ethnic minorities in New Hampshire is low, the number of asthma-related events in these groups is too small to allow for meaningful analysis. As the state's demographics change and as data collection techniques improve, it may be possible to present data on racial and ethnic minorities in the future.

I would like to see data for town, but cannot find this information in the report. Why doesn't this report show town-level data?

New Hampshire has a relatively small population of 1.3 million people divided among 234 cities and towns. In a given year, the number of hospitalizations or deaths due to asthma is too small to generate meaningful results on a town level.

I am interested in looking at asthma mortality rates by year, but this report includes only 3-year rates. Why?

Only a small number of deaths from asthma occur in New Hampshire each year. Rates need to be calculated with at least 10 events in the numerator. Calculating a rate based on fewer than 10 events in the numerator creates an unstable estimate that is not statistically reliable and varies greatly from year to year by chance alone. For this reason, three years of data are aggregated to create more stable rates for asthma mortality.

Some of the information in the report is identified as "age-adjusted". What does this mean and why is it done?

To compare populations where the distribution of age groups is different, an adjustment needs to be made. For example, the rate of asthma in New Hampshire may appear higher than that of the United States. However, this may be due to New Hampshire having a greater proportion of older people than the United States. By age-adjusting the New Hampshire data using the 2000 United States standard population, rates can be compared without concern about differences in the age distribution of the two populations.

This report summarizes data from 1990-2004, but it is now 2006. Why is there such a long time between data acquisition and publication?

New Hampshire Hospital Discharge data are available approximately 18-24 months after the close of the calendar year. For example, data for 2004 became available mid-2006. BRFSS data are generally available 6-8 months after the close of the calendar year. New Hampshire mortality data have the longest lag time; it is not available until 3 or more years after the close of the calendar year.

What does the 95% confidence interval mean?

A 95% confidence interval is reported around many statistics, especially those for asthma prevalence from the Behavioral Risk Factor Surveillance System. Since only a sample of New Hampshire residents are interviewed for the BRFSS, the *exact* frequency of asthma in the entire population is unknown. As a result, the population frequency is estimated using the information from the sample. The 95% confidence interval represents the range of values that, with 95% certainty, includes the true value for the entire population. For example, 15.0% of adults in New Hampshire reported they had ever been diagnosed with asthma. The 95% confidence interval was 13.8%-16.2%. This can be interpreted to mean that our best estimate is that 15.0% of persons have ever been diagnosed with asthma, but that the true value could actually be as low as 13.8% or as high as 16.2%. In other words, the estimate from the survey has a margin of error of $\pm 1.2\%$.

A 95% confidence interval is also reported for administrative data sets (inpatient hospital discharge data, outpatient hospital discharge data, morbidity data, and Medicaid claims data). Administrative data sets contain all events, unlike survey data; however, confidence intervals are still important particularly in a small state like New Hampshire. Confidence intervals around administrative data represent expected variability from year to year or between groups based on the number of events and the size of the population.

How do I know if differences are statistically significant?

The confidence interval can be used to evaluate the statistical significance between two rates. If the interval for one rate does not overlap the interval for another, it is very likely that the difference between the rates is statistically significant. If the confidence intervals do overlap, no statistically significant difference between the rates being compared was detected. This could mean that no difference actually exists, or if they are survey data it could mean that a difference does exist but was not detected due to insufficient sample size.

What are the Centers for Disease Control and Prevention?

The Centers for Disease Control and Prevention (CDC) are part of the United States Department of Health and Human Services. The mission of the CDC is to promote health and quality of life by preventing and controlling disease, injury, and disability. The National Asthma Control Program, which is part of CDC's Air Pollution and Respiratory Health Branch, provides funds and guidance to states for their asthma control efforts. In October 2001, New Hampshire received funding from the CDC to establish an asthma control program in the state, and in September 2004, New Hampshire received a 2nd grant to implement asthma activities.

Where can I get more information on asthma prevention, treatment, and research?

The National Asthma Control Program website is a good general resource for asthma and can be found at: <http://www.cdc.gov/asthma>.

Detailed information on asthma and other lung diseases is available from the National Heart, Lung, and Blood Institute (NHLBI) at <http://www.nhlbi.nih.gov/health/public/lung/index.htm>, or the American Lung Association at <http://www.lungusa.org>.

The New Hampshire chapter of the American Lung Association can be reached at 1-800-LUNG-USA or <http://www.nhlung.org>.

The New Hampshire Asthma Control Program can be reached at: 1-800-852-3345 ext. 0856 or <http://www.dhhs.nh.gov/DHHS/CDPC/asthma.htm> or <http://www.asthmanow.net>

OVERVIEW OF DATA SOURCES

The data sources used for asthma surveillance in New Hampshire are based on the recommendations of national organizations such as the Centers for Disease Control and Prevention (CDC) and the Council of State and Territorial Epidemiologists (CSTE).

Behavioral Risk Factor Surveillance System

The *Behavioral Risk Factor Surveillance System* (BRFSS) is a population-based, random, digit-dialed telephone survey of civilian, non-institutionalized adults, aged 18 years and older. The BRFSS is conducted by the health departments of all states, the District of Columbia, Puerto Rico, the Virgin Islands, and Guam with assistance from CDC. New Hampshire has participated in the BRFSS since 1987. The BRFSS includes questions on health and behavior risk factors such as safety belt use, diet, weight control, asthma, alcohol use, physical exercise, and preventive health screenings and is a primary source of information for New Hampshire on health conditions and health related behaviors.

A core set of questions, which has included adult asthma prevalence, is asked annually. Additional questions on asthma are asked in optional sections on adult asthma history and childhood asthma. The data are weighted by probability of selection, age and gender. This adjusts the data to compensate for non-response and non-coverage and to more accurately reflect the population of New Hampshire. Unlike the majority of other states, New Hampshire's BRFSS data are not weighted by race or ethnicity due to the small number of minorities in New Hampshire and resulting small survey sample size for minority populations.

This report contains BRFSS data from 2000-2004. In 2004, 5,065 interviews were completed. BRFSS data and information on BRFSS survey methods can be accessed on-line at: <http://www.cdc.gov/brfss>. Additional information on the New Hampshire BRFSS is available from the Health Statistics and Data Management Section at: <http://www.dhhs.nh.gov/DHHS/HSDM/behavioral-risk.htm>

SMART BRFSS

Selected Metropolitan/Micropolitan Area Risk Trends BRFSS (SMART BRFSS) uses the BRFSS to analyze data of selected metropolitan and micropolitan statistical areas with 500 or more respondents. This data source was created to help fill the need for local level data. Only the two core BRFSS asthma questions, "Have you ever been told by a doctor, nurse or other health professional that you have asthma?" and "Do you still have asthma?", are analyzed by smaller geographic areas. Additional information on the SMART BRFSS is available from the Centers for Disease Control and Prevention at: <http://apps.nccd.cdc.gov/brfss-smart/index.asp>.

National Survey of Children's Health

The *National Survey of Children's Health* (NSCH) estimates the prevalence of asthma among children. It is a population-based, random, digit-dialed telephone survey. Telephone numbers are called at random to identify households with one or more children under 18 years old. One child in each household is randomly selected to be the subject of the interview. Approximately 2,000 surveys are collected by each state, and survey results are weighted to represent the population of non-institutionalized children ages 0-17 nationally and in each state.

Currently, this is the only source New Hampshire has that estimates the prevalence of asthma among children; however, the 2005 BRFSS will be able to provide this information. Additional information about this survey is available on-line at:
<http://www.cdc.gov/nchs/about/major/slaits/nsch.htm>.

Inpatient Hospital Discharge Data

Data on all New Hampshire hospitalizations are abstracted from medical records upon patient discharge and reported to the Department of Health and Human Services. The inpatient data set contains discharge records on admissions for stays of 24 hours or more at all 26 acute-care, non-federal, inpatient facilities in the state. The Health Statistics and Data Management Section oversees this data set. Hospitalization data are coded under the Ninth Revision of the International Classification of Diseases-Clinical Modification (ICD-9-CM). This report contains data on asthma inpatient hospitalizations from 1996-2004. Additional information about New Hampshire hospital discharge data is available on-line at:
<http://www.dhhs.nh.gov/DHHS/HSDM/hospital-discharge-data.htm>

National Hospital Discharge Survey

The *National Hospital Discharge Survey* is a national survey that is conducted annually. It collects data from approximately 270,000 randomly selected inpatient records from a national sample of approximately 500 hospitals. This data source is used when comparing New Hampshire asthma hospital discharge rates to national rates. Additional information about this survey is available on-line at: <http://www.cdc.gov/nchs/about/major/hdasd/nhds.htm>.

Outpatient Hospital Discharge Data

The outpatient data set contains discharge records for hospital emergency department visits, observation stays in the emergency department after illness or injury, and hospital visits for scheduled ambulatory surgeries. The Health Statistics and Data Management Section also oversees this data set. Outpatient data are coded under ICD-9-CM. This report contains data on asthma outpatient hospital visits from 1996-2004. Additional information about New Hampshire outpatient hospital discharge data is available on-line at:
<http://www.dhhs.nh.gov/DHHS/HSDM/hospital-discharge-data.htm>

National Hospital Ambulatory Medical Care Survey

The *National Hospital Ambulatory Medical Care Survey* collects data on the utilization and provision of ambulatory care services in hospital emergency and outpatient departments. This survey is based on a national sample of approximately 36,500 visits to the emergency department and 31,000 outpatient department visits from a national sample of hospitals. This data source is used when comparing New Hampshire asthma emergency department visit rates to national rates. Additional information about this survey is available on-line at:

<http://www.cdc.gov/nchs/about/major/ahcd/ahcd1.htm> .

Mortality

New Hampshire law requires that reports of all deaths be filed with the office of the State Registrar at the New Hampshire Department of State, Division of Vital Records Administration. Filings are made by hospital personnel, physicians, funeral directors, city/town clerks, attorneys, and clerks of the court. Reports of New Hampshire resident deaths in other states and Canada are provided to the State Registrar, for statistical purposes only, under an inter-state/Canadian agreement for the exchange of vital events information. The 1998 New Hampshire Vital Statistics Report may be accessed on-line at:

<http://www.dhhs.nh.gov/DHHS/HSDM/LIBRARY/Data-Statistical+Report/vitalstats98.htm>.

Mortality data in this report refer to the underlying cause of death, which is the specific disease, condition, or injury that initiated the chain of events leading to death. The underlying cause of death is not always the same as the immediate cause of death. For example, if a person was hospitalized for asthma, but developed pneumonia and died while in the hospital, the underlying cause of death would be asthma and the immediate cause would be pneumonia.

Deaths are coded based on the applicable revision of the International Classification of Diseases (ICD). From 1979-1998, deaths were coded under ICD Revision 9. In 1999, deaths began to be coded under ICD Revision 10. The National Center for Health Statistics reports a comparability ratio of 0.8938 for the coding of asthma mortality under ICD-10 as compared to ICD-9. This means that approximately 11 percent fewer deaths will be classified with asthma as the underlying cause under ICD-10 than under ICD-9. This report contains data on asthma mortality from 1990-2000. Additional information on deaths in New Hampshire is available at: <http://www.dhhs.nh.gov/DHHS/HSDM/death-data.htm>.

Healthy People 2010

Healthy People 2010 is a set of national health targets to be met by 2010. It builds on initiatives pursued over the past two decades, including those described in the *1979 Surgeon General's Report, Healthy People*, and *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*. It is designed to achieve two overarching goals: 1) increase quality and years of healthy life, and 2) eliminate health disparities. Eight *Healthy People 2010* objectives address asthma (see *Appendix B*). A copy of *Healthy People 2010* can be obtained on-line at: <http://www.healthypeople.gov>.

Healthy New Hampshire 2010

Healthy New Hampshire 2010 is New Hampshire's health promotion and disease prevention agenda for the first decade of the 21st century. Similar to *Healthy People 2010*, it is a compilation of health objectives to be met by 2010. *Healthy New Hampshire 2010* has one asthma-related objective: to reduce pediatric hospitalizations for asthma (see *Appendix B*). A copy of *Healthy New Hampshire 2010* can be obtained on-line at:

<http://www.healthynh2010.org>.

Youth Tobacco Survey

The *Youth Tobacco Survey* (YTS) measures tobacco related knowledge, attitudes, and behaviors among students in grade six through twelve. The 2004 New Hampshire YTS included the two asthma prevalence questions from the BRFSS, "Have you ever been told by a doctor that you have asthma?" and "Do you still have asthma?", for the first time. This survey provides an asthma prevalence rate for school children grades six through twelve. Additional information on the Youth Tobacco Survey in New Hampshire is available on-line at:

<http://www.dhhs.nh.gov/DHHS/ATOD/LIBRARY/Data-Statistical+Report/yts-results.htm>

1. ASTHMA PREVALENCE AND CONTROL

Prevalence data are important to asthma surveillance because they estimate how many people have asthma and help characterize the population with asthma in terms of age, gender, and other demographic factors. This type of information can provide an indication of the burden of asthma on the population and identify groups that may be disproportionately affected by the disease. Prevalence data can also be used to examine trends in the occurrence of asthma over time. These data may underestimate the burden of asthma in the population because they capture only those individuals who have been diagnosed with asthma by a doctor or other health professional and not those who have not been diagnosed.

The Behavioral Risk Factor Surveillance System (BRFSS) is a population-based telephone survey of adults aged 18 and older that is coordinated by the Centers for Disease Control and Prevention. It is designed to monitor the prevalence of the major behavioral health risks associated with premature morbidity and mortality. New Hampshire has participated in the BRFSS since 1987. In 2000, the CDC added two asthma questions to the BRFSS core survey in an effort to systematically collect data on adult asthma prevalence in all participating states and territories. Results from these two questions provide information on lifetime and current asthma prevalence among adults.

This section presents data from the 2000-2004 New Hampshire BRFSS and 2003 National Survey of Children's Health. It includes information on lifetime and current asthma prevalence among adults and children in the state. Data were analyzed by age, gender, education, and income groups whenever possible to determine whether asthma prevalence varied by these demographic factors. Trend analyses are also presented to observe any changes in prevalence that may have occurred over time. In addition, factors such as general health status, physical health, mental health, overall health, diabetes, smoking status, indoor air quality and air pollution, weight, physical activity, and influenza vaccination were compared among adults with and without current asthma.

A list of asthma questions used in the 2004 New Hampshire BRFSS survey can be found in Appendix A.

METHODS

DEFINITIONS:

Lifetime asthma refers to the number of people who answered "yes" to the question: "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"

Current asthma refers to the number of people who answered "yes" to two questions: "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Mean is calculated by adding the number of responses of interest and dividing by the total number of respondents.

Median is calculated by identifying the midpoint of a range of numbers that are arranged in order of value.

DATA SOURCE AND QUALITY OF DATA:

BRFSS

The Behavioral Risk Factor Surveillance System (BRFSS) measures the prevalence of asthma, other chronic disease, and health behaviors among adults. The BRFSS is a random, digit-dialed telephone survey of adults aged 18 years or older who have landline telephones and do not live in group quarters (such as dormitories), or institutions (such as prisons). The survey is conducted by all 50 states with the assistance of the Centers for Disease Control and Prevention (CDC). The States and CDC have developed rigorous survey methods, including methods to increase survey response and quality assurance checks to make BRFSS data some of the best telephone survey data available. However, there are some limitations to the BRFSS data that should be kept in mind when interpreting results.

One potential source of error for the BRFSS is that health behaviors are reported by respondents. Inaccurate recall by respondents may lead to response bias and recall bias and result in under or over estimation of specific behaviors or conditions.

Because the BRFSS conducts interviews using only landline telephones, those adults without phone service in their homes or those using only cell phones are not covered by the survey sampling frame. In the 2000 Census, only 2% of the adult New Hampshire population lacked telephone service in their home. However, the number of adults relying solely on cell phones is growing and is likely higher among younger adults. These issues may affect the representativeness of this survey, particularly among minorities, lower income and younger adults. BRFSS attempts to adjust for this “non-coverage” by weighting the survey data. The impact of weighting is that each respondent is made to represent a given number of New Hampshire residents of the same age group and gender. This assumes that adults participating in the survey are similar to those of the same age and gender who do not participate. For example, adult females aged 18-24 who have landline telephones are assumed to be similar to adult females aged 18-24 who do not have landline telephones. This may not be true and should be kept in mind when interpreting results.

The low proportion of minorities in New Hampshire results in a small number of individuals from minority ethnic and racial groups in the BRFSS sample. The number sampled is too small to provide reliable prevalence estimates for these groups. Because of the low proportion of racial and ethnic minorities in New Hampshire, the New Hampshire BRFSS is not weighted by race or ethnicity.

One way BRFSS data quality can be assessed is by calculating “outcome rates”. One outcome rate is the cooperation rate: the number of people who are interviewed divided by the number of

people identified as eligible. In 2004, the cooperation rate for New Hampshire was 72%; the national median was 77%. Another type of outcome rate often used for telephone surveys is the Council of American Survey Research Organizations (CASRO) response rate. CASRO is a measure of both efficiency of the sampling frame (the telephone numbers used to conduct the survey) and the cooperation of the respondents; the higher the CASRO rate the better. The CASRO response rate for the 2004 New Hampshire BRFSS was 46%. The national median CASRO rate for 2004 was 53%. Over time, the CASRO rate for the BRFSS has declined in all states. CDC and health researchers are working to identify new methods to address problems causing the declining rates, including changes in communications technology. Until acceptable methods are identified and applied however, response rates are likely to continue to decline.

Although some data quality issues do exist for the BRFSS, rigorous data collection and quality assurance protocols developed and applied by CDC's Behavioral Surveillance Branch and the New Hampshire Department of Health and Human Services, Health Statistics and Data Management Section make New Hampshire BRFSS data some of the highest quality telephone survey data available.

SMART BRFSS

The Selected Metropolitan/Micropolitan Area Risk Trends BRFSS (SMART BRFSS) analyzes data for selected metropolitan and micropolitan statistical areas with 500 or more respondents. This data source was created to help fill the need for local level data. Only the two core BRFSS asthma questions, "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?", were broken down into these smaller geographic areas. In addition to the data quality issues of the BRFSS, this data source may experience changes in how specific geographic areas are defined over time due to an increase or decrease in population.

National Survey of Children's Health

The *National Survey of Children's Health* (NSCH) measures the prevalence of asthma and other health conditions among children 0-17 years. The NSCH is a random, digit-dialed telephone survey that was conducted in 2003. Approximately 2,000 surveys were collected by each state and weighted to represent the population of non-institutionalized children ages 0-17 nationally and in each state. The data quality issues of NSCH are similar to the BRFSS.

NSCH was sponsored by the Maternal and Child Health Bureau, US Department of Health and Human Services, and the National Center for Health Statistics of the Centers for Disease Control and Prevention.

ANALYSES:

SAS-Callable SUDAAN 9.0 was used to conduct analyses using BRFSS data.

The lifetime asthma prevalence rate is calculated by dividing the number of people who report lifetime asthma by the number of people who completed the survey, excluding “Don’t know/ Not sure” and “Refused” responses.

The current asthma prevalence rate is calculated by dividing the number of people who report current asthma by the number of people who completed the survey, excluding “Don’t know/ Not sure” and “Refused” responses.

National Comparisons

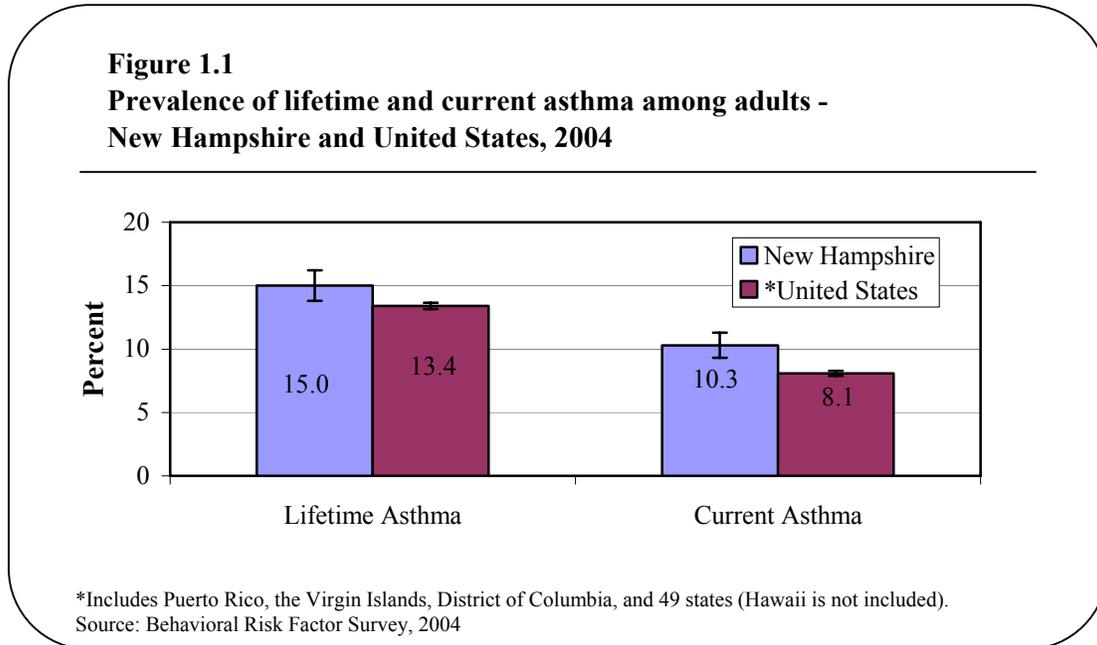
BRFSS data from Puerto Rico, Virgin Islands, District of Columbia, and 49 states (Hawaii did not report BRFSS data for 2004) were combined to estimate the national prevalence of asthma. Some health researchers feel it is more appropriate to report the median rather than the mean as an estimate of the national prevalence and vice versa. For this report, both the mean and median were calculated for all analyses. The mean is reported in graphs and tables because it enables the reader to make statistical inferences between New Hampshire and US data, and it can be shown with confidence intervals, allowing the reader to see some of the error associated with survey data. With regard to comparisons: only comparisons between New Hampshire data were assessed for statistical differences; because demographic differences were not controlled for, NHACP did not look for statistically significant differences between New Hampshire and US data. Although the mean is reported in the tables and graphs, on occasion the median is reported with a range to give the reader an idea of how prevalence changes state by state.

Confidence Intervals

Ninety-five percent confidence intervals (95% CI) are presented along with point estimates for survey data. Because this information was collected from a sample of the population, each percentage is an estimate of the true prevalence.

Asthma in Adults

Figure 1.1 shows the prevalence of lifetime and current asthma among adults in New Hampshire compared to the United States.



Comment: Overall in 2004, 15.0% (95% CI: 13.8-16.2) of New Hampshire adults reported being told they had asthma at some time in their life, and approximately 10.3% (95% CI: 9.3-11.3) of adults said they had current asthma.

Lifetime asthma prevalence among adults for the United States as a whole was 13.4% (95% CI: 13.1-13.6) and current asthma prevalence was 8.1% (95% CI: 7.9-8.3) in 2004. The median lifetime and current asthma prevalence estimates among adults for all US states in 2004 was 13.2% (range: 10.3-18.8) and 8.2% (range: 4.6-10.3) respectively.

New Hampshire has one of the highest prevalence rates for asthma in the nation; however, it is difficult to determine with certainty that any one state has the highest prevalence of asthma because of the varying demographic characteristics among states.

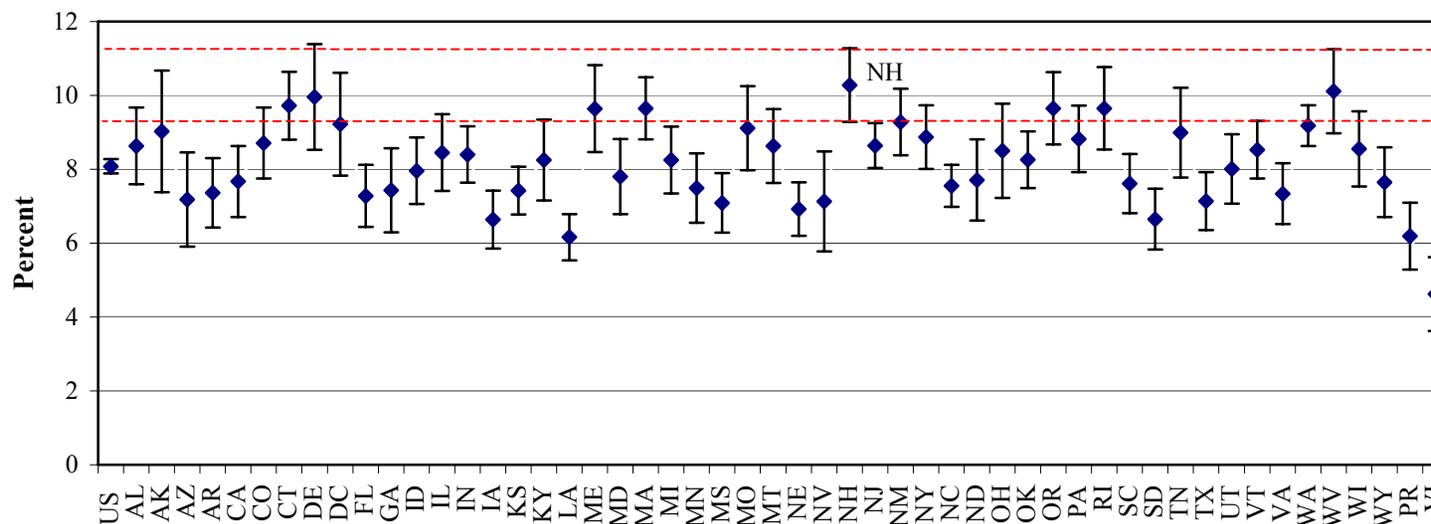
Table 1.1
Prevalence of lifetime and current asthma among adults -
New Hampshire and United States, 2004

	Lifetime Asthma		Current Asthma	
	Percent	(95% CI)	Percent	(95% CI)
New Hampshire	15.0	(13.8-16.2)	10.3	(9.3-11.3)
*United States	13.4	(13.1-13.6)	8.1	(7.9-8.3)

*Includes Puerto Rico, the Virgin Islands, District of Columbia, and 49 states (Hawaii is not included).
 Source: Behavioral Risk Factor Survey, 2004.

Figure 1.2 shows the prevalence of current asthma by state and territory. This figure is presented to show how current asthma prevalence rates vary state by state.

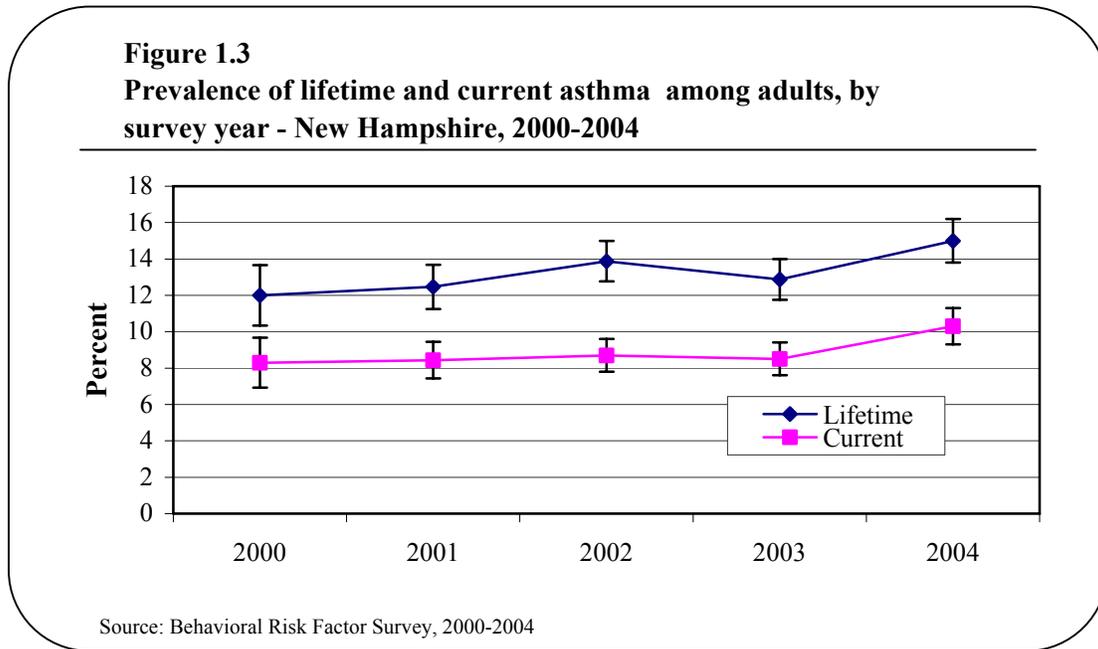
Figure 1.2
Prevalence of current asthma among adults (percent by state or territory), 2004



Source: Behavioral Risk Factor Survey, 2004

Comment: The graph above displays adult self-reported current asthma prevalence rates by state and territory. The 95% confidence intervals (displayed by cross-sectional lines through the diamond) represent the range of values that, with 95% certainty, includes the true value for the entire population; the distance between the two dashed lines represents the width of New Hampshire’s 95% confidence interval. It is important to remember that survey data have error and variability, making it inappropriate to rank and compare states based solely on the point estimate without considering the confidence intervals. A point estimate (represented by the diamonds) for any state may be higher or lower than another, but statistically we cannot be sure they are different. Some of this uncertainty is represented in the confidence interval; however, determining statistically significant differences across many groups is difficult and cannot be determined by looking solely at confidence intervals. In addition, these data do not control for different demographic factors that characterize state populations; this compounds the difficulty of making comparisons across states.

Figure 1.3 shows the prevalence of lifetime and current asthma among adults in New Hampshire from 2000-2004.



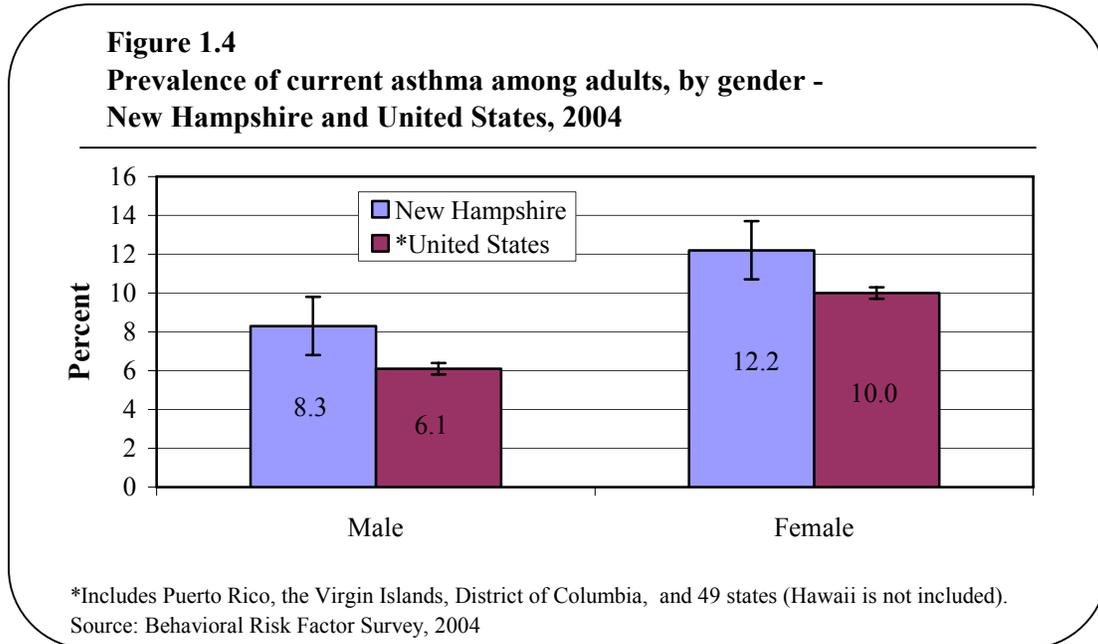
Comment: The prevalence of lifetime and current asthma has increased every year since 2000 except for 2003.

Table 1.2
Prevalence of lifetime and current asthma among adults, by survey year – New Hampshire and United States, 2000-2004

Year	Lifetime Asthma		Current Asthma	
	Percent	(95% CI)	Percent	(95% CI)
2000	12.0	(10.3-13.7)	8.3	(6.9-9.7)
2001	12.5	(11.3-13.7)	8.4	(7.4-9.4)
2002	13.9	(12.8-15.0)	8.7	(7.8-9.6)
2003	12.9	(11.8-14.0)	8.5	(7.6-9.4)
2004	15.0	(13.8-16.2)	10.3	(9.3-11.3)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.4 compares the prevalence of current asthma among adult males and females in New Hampshire to the United States.



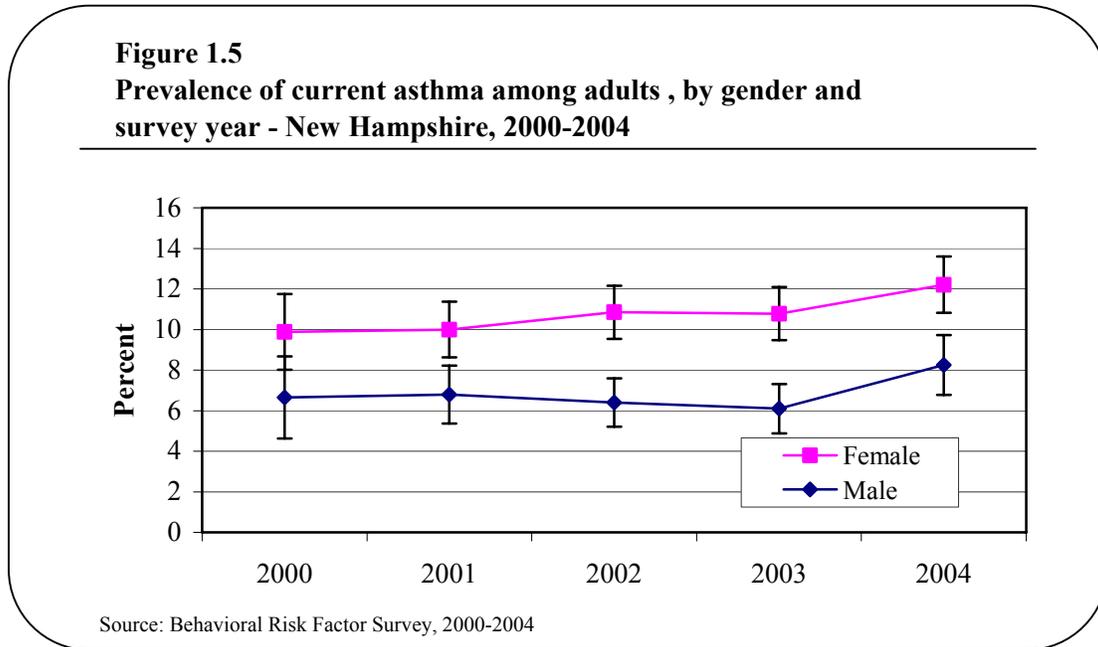
Comment: In 2004, approximately 8.3% (95% CI: 6.8-9.7) of adult males and 12.2% (95% CI: 10.8-13.6) of adult females in New Hampshire said they had current asthma, compared to 6.1% (95% CI: 5.8-6.3) of males and 10.0% (95% CI: 9.7-10.2) of females in the US. The prevalence of current asthma among females was statistically significantly different than among males, both in New Hampshire and nationally. The median current asthma prevalence estimates for all males and females in the US in 2004 were 6.2 (range: 2.3-8.4) and 10.0 (range: 6.6-12.7).

Table 1.3
Prevalence of current asthma among adults, by gender -
New Hampshire and United States, 2004

Gender	New Hampshire		*United States	
	Percent	(95%CI)	Percent	(95%CI)
Male	8.3	(6.8-9.7)	6.1	(5.8-6.3)
Female	12.2	(10.8-13.6)	10.0	(9.7-10.2)
Total	10.3	(9.3-11.3)	8.1	(7.9-8.3)

*Includes Puerto Rico, the Virgin Islands, District of Columbia, and 49 states (Hawaii is not included).
 Source: Behavioral Risk Factor Survey, 2004

Figure 1.5 shows the prevalence of current asthma among adults in New Hampshire by gender from 2000 to 2004.



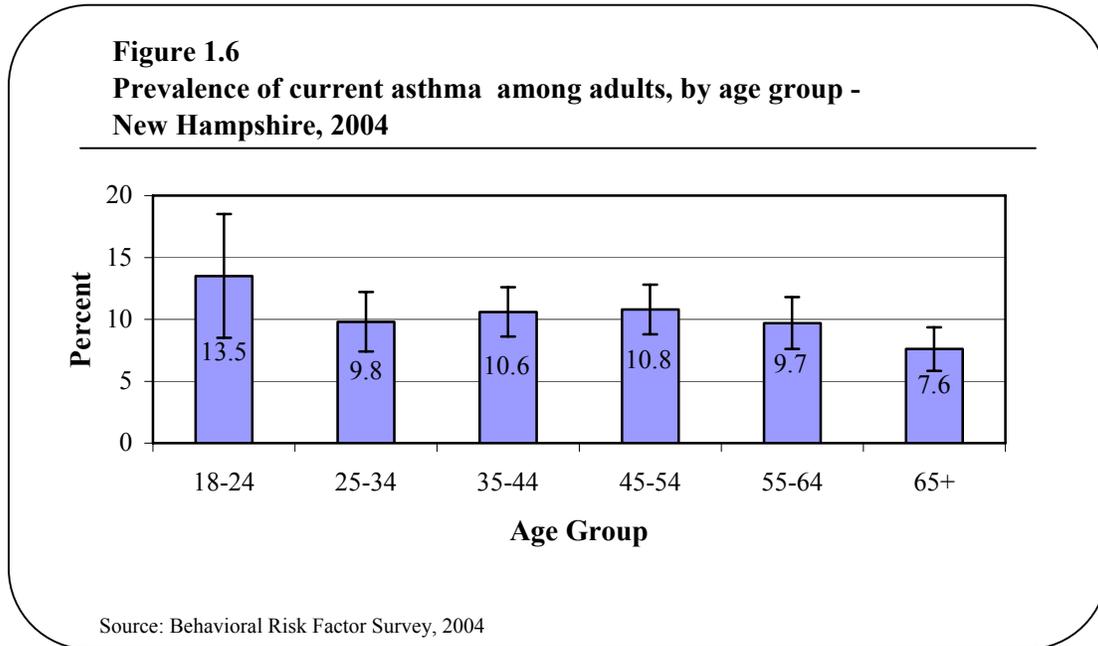
Comment: From 2000-2004, there appears to be a general increase in the prevalence of current asthma among adult females over time, and the prevalence of current asthma among adult females has been consistently higher than for adult males.

Table 1.4
Prevalence of current asthma among adults, by gender and survey year - New Hampshire, 2000-2004

Year	Male		Female	
	Percent	(95% CI)	Percent	(95% CI)
2000	6.7	(4.6-8.7)	9.9	(8.0-11.7)
2001	6.8	(5.4-8.2)	10.0	(8.6-11.4)
2002	6.4	(5.2-7.6)	10.9	(9.5-12.2)
2003	6.1	(4.9-7.3)	10.8	(9.5-12.1)
2004	8.3	(6.8-9.7)	12.2	(10.8-13.6)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.6 shows the prevalence of current asthma among adults in New Hampshire by age group.



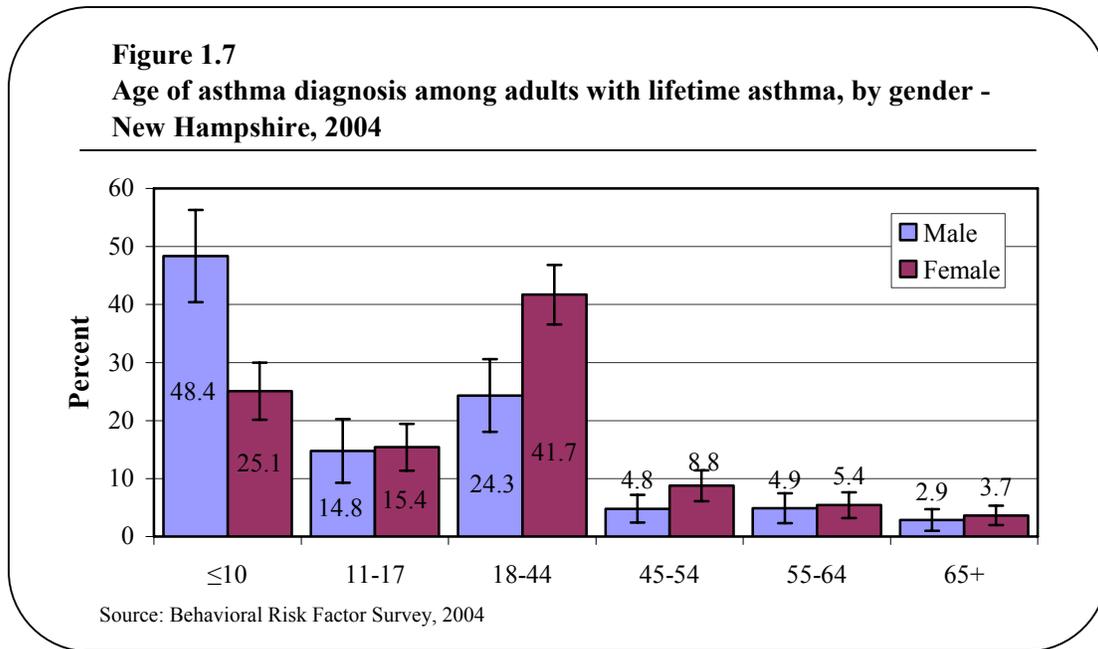
Comment: In 2004, there did not appear to be a difference in the prevalence of current asthma among New Hampshire adults by age group; this is a change from 2002. In 2002, adults aged 25 to 34 appeared to report current asthma more often than those 65 and older.

Table 1.5
Prevalence of current asthma among adults, by age group -
New Hampshire and United States, 2004

Age Group	New Hampshire		*United States	
	Percent	95% CI	Percent	95% CI
18-24	13.5	(8.5-18.5)	9.0	(8.2-9.8)
25-34	9.8	(7.4-12.3)	7.6	(7.2-8.1)
35-44	10.6	(8.6-12.6)	7.7	(7.3-8.0)
45-54	10.8	(8.8-12.7)	8.4	(7.9-8.8)
55-64	9.7	(7.7-11.8)	9.0	(8.6-9.5)
65+	7.6	(5.9-9.4)	7.4	(7.1-7.8)
Total	10.3	(9.3-11.3)	8.1	(7.9-8.3)

*Includes Puerto Rico, the Virgin Islands, District of Columbia, and 49 states (Hawaii is not included).
 Source: Behavioral Risk Factor Survey, 2004

Figure 1.7 shows the age of asthma diagnosis among adults with lifetime asthma in New Hampshire, by gender.



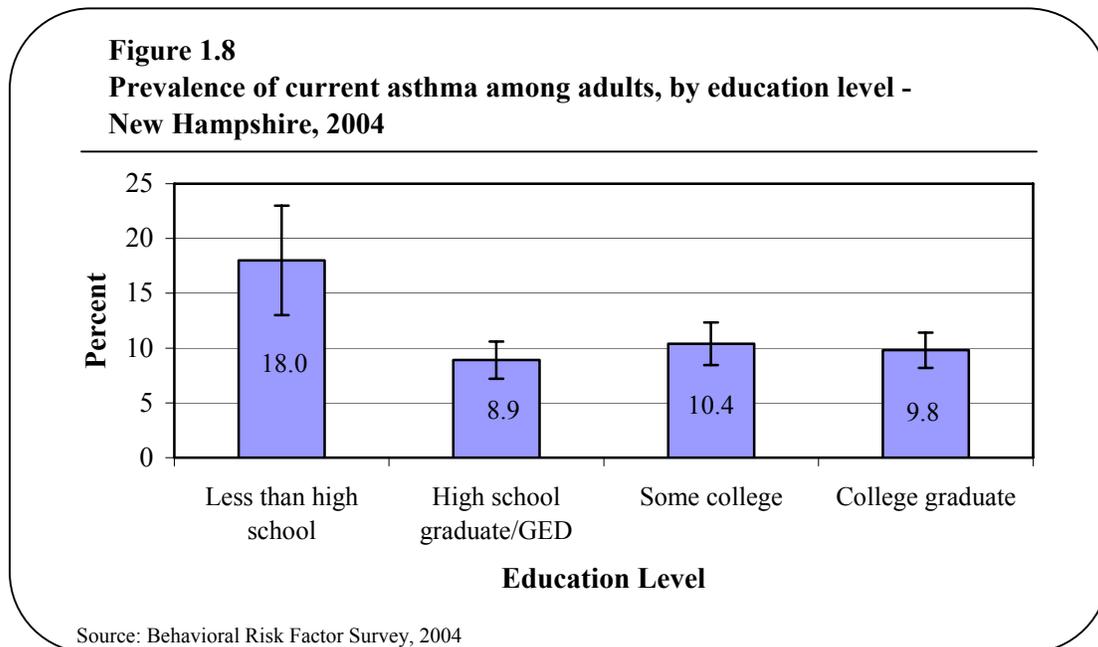
Comment: In 2004, the majority of adult males in New Hampshire who have ever been diagnosed with asthma were diagnosed as a young child. However, females were more likely to have been diagnosed between the ages of 18-44. A similar age, gender pattern is seen nationally.

Table 1.6
Age of asthma diagnosis among adults with lifetime asthma, by gender -
New Hampshire, 2004

Age Group	Male		Female	
	Percent	95% CI	Percent	95% CI
≤10	48.4	(40.4-56.4)	25.1	(20.2-30.0)
11-17	14.8	(9.3-20.3)	15.4	(11.4-19.5)
18-44	24.3	(18.0-30.6)	41.7	(36.6-46.8)
45-54	4.8	(2.4-7.2)	8.8	(6.1-11.4)
55-64	4.9	(2.3-7.5)	5.4	(3.2-7.6)
65+	2.9	(1.0-4.7)	3.7	(2.0-5.3)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.8 shows the prevalence of current asthma among adults in New Hampshire by education level.



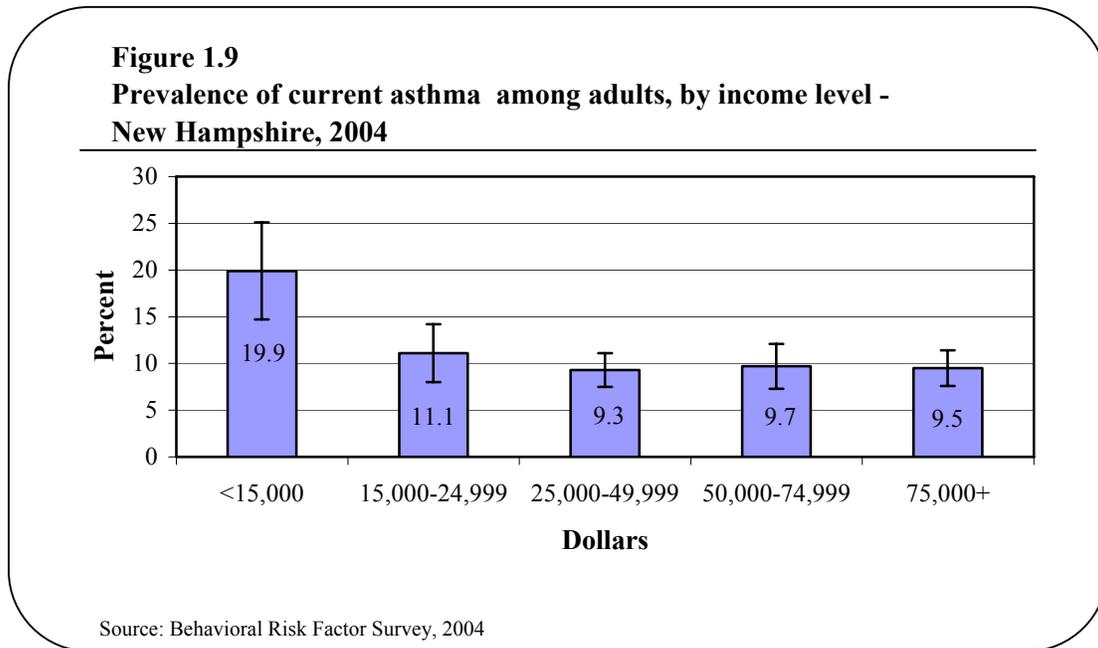
Comment: In 2004, both in New Hampshire and nationally, adults with less than a high school level of education appear to report current asthma more often than high school graduates, adults with some amount of college education, and college graduates; this is a slight change from 2002. In 2002, New Hampshire adults with less than a high school level of education did not appear to report current asthma more often than college graduates. The prevalence of asthma has increased among all education levels since 2002 but the greatest increases occurred among adults with less than a high school level of education and those with some college education.

Table 1.7
Prevalence of current asthma among adults, by education level -
New Hampshire and United States, 2004

Education Level	New Hampshire		*United States	
	Percent	95% CI	Percent	95% CI
Less than high school	18.0	(13.0-23.0)	9.6	(8.9-10.2)
High school graduate/GED	8.9	(7.2-10.6)	7.7	(7.4-8.0)
Some college	10.4	(8.5-12.3)	8.6	(8.2-9.0)
College graduate	9.8	(8.2-11.4)	7.4	(7.1-7.7)
Total	10.3	(9.3-11.3)	8.1	(7.9-8.3)

*Includes Puerto Rico, the Virgin Islands, District of Columbia, and 49 states (Hawaii is not included).
 Source: Behavioral Risk Factor Survey, 2004

Figure 1.9 shows the prevalence of current asthma among adults in New Hampshire by income level.



Comment: In 2004, both in New Hampshire and nationally, adults who reported an annual household income below 15,000 dollars appear to report current asthma more often than those who reported an income greater than 15,000 dollars. A similar pattern is observed nationally.

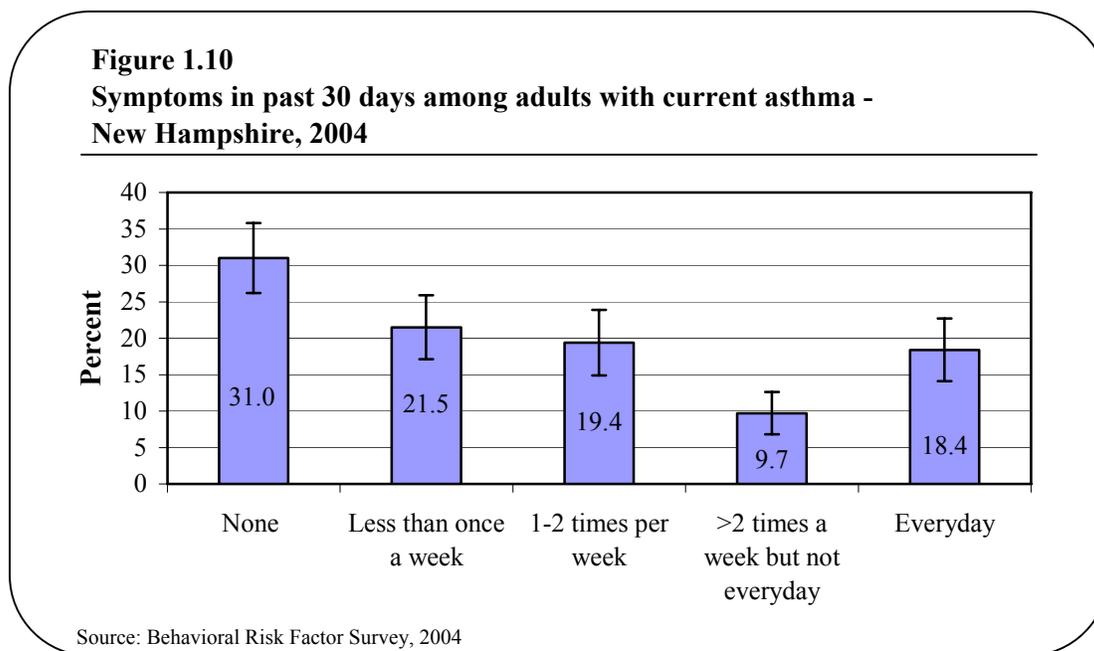
Table 1.8
Prevalence of current asthma among adults, by income level -
New Hampshire and United States, 2004

Income Level	New Hampshire		*United States	
	Percent	95% CI	Percent	95% CI
Less than \$15,000	19.9	(14.7-25.1)	10.9	(10.3-11.6)
\$15,000-\$24,000	11.1	(8.0-14.2)	9.1	(8.6-9.6)
\$25,000-\$49,999	9.3	(7.5-11.1)	7.7	(7.3-8.0)
\$50,000-\$74,999	9.7	(7.3-12.1)	7.5	(7.0-8.0)
\$75,000 and higher	9.5	(7.6-11.4)	6.9	(6.5-7.3)
Total	10.3	(9.3-11.3)	8.1	(7.9-8.3)

*Includes Puerto Rico, the Virgin Islands, District of Columbia, and 49 states (Hawaii is not included).
Source: Behavioral Risk Factor Survey, 2004

Asthma Control and Management Among Adults with Current Asthma

Figures 1.10 through 1.16 are presented to help assess the management and control of asthma among adults in New Hampshire with asthma.



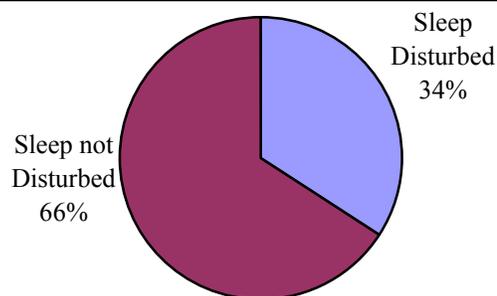
Comment: When asthma is managed according to established guidelines, issued by the National Asthma Education and Prevention Program (NAEPP), people with asthma should experience minimal or no chronic symptoms. In 2004, 69.0% (95% CI: 64.3-73.8) of New Hampshire adults with current asthma reported they experienced asthma symptoms in the past 30 days. In comparison, combined BRFSS data from twenty-six states* (including New Hampshire) that used the adult asthma questions on their survey in 2004 indicated that approximately 73.0% (95% CI: 71.4-74.6) of adults with current asthma had symptoms in the past 30 days (median 73.2% (range: 63.5-83.3)).

Almost half of New Hampshire adults with asthma (47.5%) reported they had asthma symptoms at least once a week.

Figures 1.10- 1.16 all represent survey findings for adults with current asthma.

*Alaska, Arizona, California, Georgia, Hawaii, Idaho, Iowa, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Montana, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, Puerto Rico, Texas, Utah, Vermont, Virginia, Wisconsin

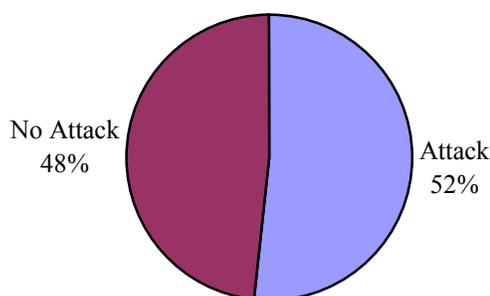
Figure 1.11
Difficulty sleeping in past 30 days due to asthma symptoms among adults - New Hampshire, 2004



Source: Behavioral Risk Factor Survey, 2004

Comment: With proper care and management, there should be minimal or no chronic nighttime asthma symptoms. Approximately 34.2% (95% CI: 28.0-40.4) of New Hampshire adults with current asthma said their sleep was disrupted due to asthma symptoms sometime in the past 30 days. According to combined 2004 BRFSS data from twenty-six states, 49.4% (95% CI: 47.2-51.6) of adults with current asthma reported sleep disturbance in the past 30 days (median 47.5% (range: 34.2-66.0)).

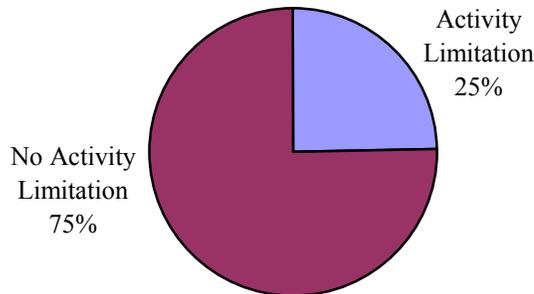
Figure 1.12
Asthma attacks in the past year among adults - New Hampshire, 2004



Source: Behavioral Risk Factor Survey, 2004

Comment: With proper care and management, individuals with asthma should have minimal or no recurrent attacks or episodes of asthma. In 2004, 51.7% (95% CI: 46.4-57.0) of New Hampshire adults with current asthma said they had at least one asthma attack in the past year. According to combined 2004 BRFSS data from twenty-six states, 55.0% (95% CI: 53.2-56.8) of adults with current asthma reported having at least one asthma attack (median 52.7% (range: 46.2-71.2)).

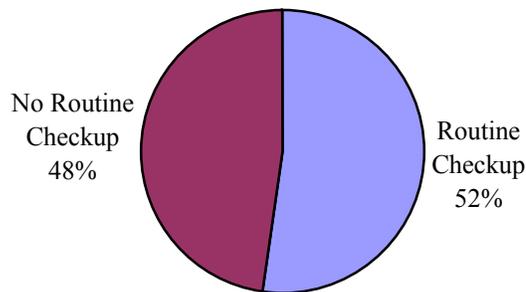
Figure 1.13
Activity limitation in the past year among adults -
New Hampshire, 2004



Source: Behavioral Risk Factor Survey, 2004

Comment: Another important goal for asthma therapy is no limitation on daily activities or missed days of school or work because of asthma. In 2004, 24.7% (95% CI: 19.9-29.5) of New Hampshire adults with current asthma said there was at least one day in the preceding year when they were unable to work or carry out their usual activities because of asthma. According to combined 2004 BRFSS data from twenty-six states, 27.2% (95% CI: 25.5-28.9) of adults with current asthma reported activity limitation due to asthma (median 24.7% (range: 12.8-41.8)).

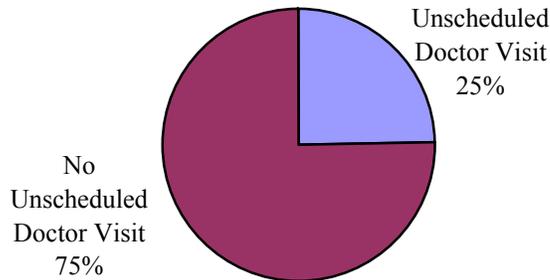
Figure 1.14
Routine checkups for asthma in the past year among
adults - New Hampshire, 2004



Source: Behavioral Risk Factor Survey, 2004

Comment: Asthma management guidelines recommend routine medical checkups for asthma every one to six months, depending on disease severity and an individual's ability to maintain control of their symptoms.⁶ In 2004, 52.4% (95% CI: 47.1-57.7) of New Hampshire adults with current asthma reported they had at least one routine asthma checkup in the preceding 12 months. According to combined 2004 BRFSS data from twenty-six states, 56.6% (95% CI: 54.8-58.4) of adults with current asthma had at least one asthma checkup in the past year (median 55.7% (range: 43.2- 64.4)).

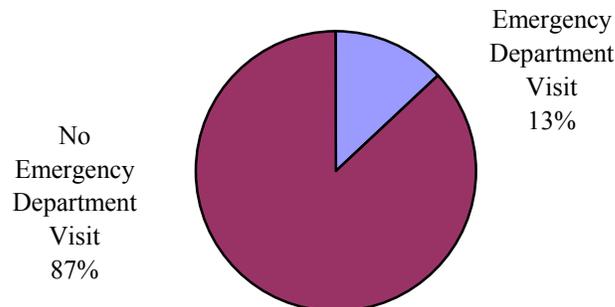
Figure 1.15
Unscheduled doctor visits for asthma in the past year
among adults - New Hampshire, 2004



Source: Behavioral Risk Factor Survey, 2004

Comment: When asthma is managed according to established guidelines, there should be minimal or no urgent, unscheduled visits to a doctor for asthma. In 2004, 24.6% (95% CI: 20.3-28.9) of New Hampshire adults with current asthma reported at least one unscheduled doctor visit for asthma in the preceding year. According to combined 2004 BRFSS data from twenty-six states, 28.7% (95% CI: 27.0-30.4) of adults with current asthma reported an unscheduled doctor visit for asthma (median 26.1% (range:17.6-39.9)).

Figure 1.16
Emergency department visits for asthma in the past
year among adults - New Hampshire, 2004

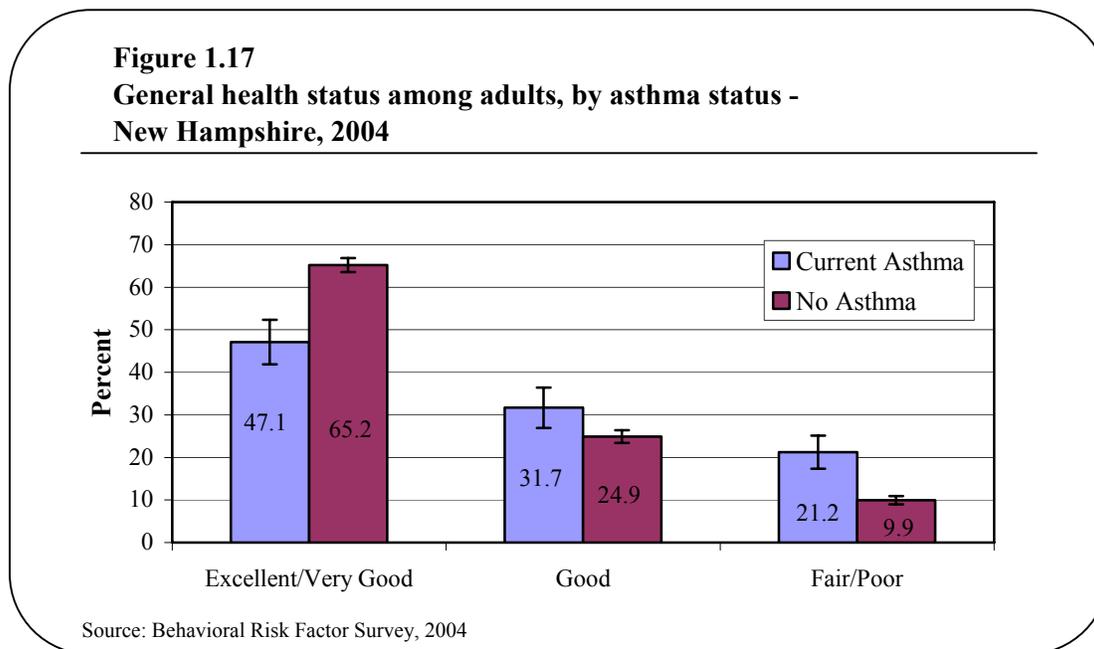


Source: Behavioral Risk Factor Survey, 2004

Comment: In 2004, 13.1% (95% CI: 9.7-16.5) of New Hampshire adults with current asthma reported at least one emergency department visit for asthma in the preceding 12 months. According to combined 2004 BRFSS data from twenty-six states, 17.4% (95% CI: 15.9-18.9) of adults with current asthma reported at least one emergency department visit for asthma (median 15.5% (range: 9.1-40.7)).

Comparisons Among Adults with and without Current Asthma

Figure 1.17 compares how adults in New Hampshire with and without current asthma categorize their health status.



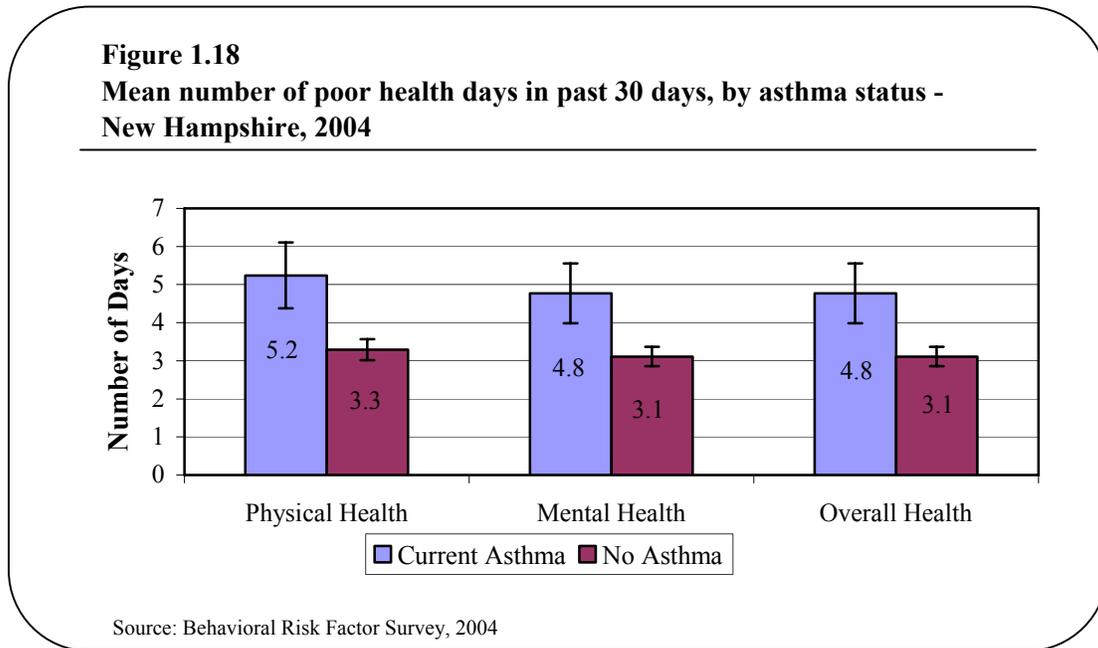
Comment: In the 2004 BRFSS survey, all adult respondents were asked to rate their general health as excellent, very good, good, fair, or poor. Approximately 47.1% (95% CI: 41.9-52.3) of New Hampshire adults with current asthma reported that their general health was excellent or very good, compared to 65.2% (95% CI: 63.6-66.8) of adults who did not have asthma. An estimated 21.2% (95% CI: 17.3-25.1) of adults with current asthma reported fair or poor health, compared to 9.9% (95% CI: 9.0-10.9) of adults who did not have asthma. There is a statistically significant difference in reported health status among people with and without current asthma for each of the three categories.

Table 1.9
General health status among adults, by asthma status –
New Hampshire, 2004

	Excellent/Very Good			Good			Fair/Poor		
	N	Percent	(95%CI)	N	Percent	(95%CI)	N	Percent	(95%CI)
Current Asthma	219	47.1	(41.9-52.3)	172	31.7	(26.9-36.4)	135	21.2	(17.3-25.1)
No Asthma	2870	65.2	(63.6-66.8)	1121	24.9	(23.4-26.4)	515	9.9	(9.0-10.9)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.18 compares the mean number of days of poor physical, mental, and overall health among adults in New Hampshire with and without current asthma.



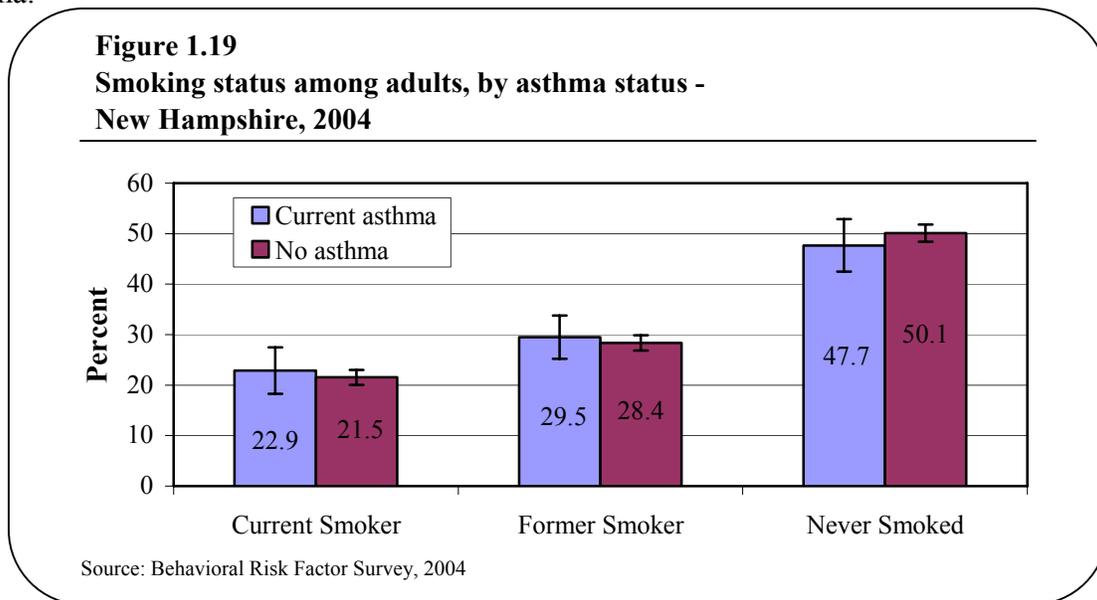
Comment: On average, adults in New Hampshire with current asthma reported experiencing approximately 2 more days per month of poor physical health than adults without asthma and over 1 ½ more days per month of poor mental and overall health. There is a statistically significant difference in the mean number of poor physical, mental, and overall health days reported by asthma status.

Table 1.10
Mean number of poor health days in past 30 days, by asthma status –
New Hampshire, 2004

	Physical Health			Mental Health			Overall Health		
	N	Mean	(95%CI)	N	Mean	(95%CI)	N	Mean	(95%CI)
Current Asthma	253	5.2	(4.4-6.1)	237	4.8	(4.0-5.6)	161	4.8	(4.0-5.6)
No Asthma	1422	3.3	(3.0-3.6)	1356	3.1	(2.9-3.4)	827	3.1	(2.9-3.4)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.19 compares smoking status among adults in New Hampshire with and without current asthma.



Comment: Approximately 22.9% (95% CI: 18.3-27.4) of New Hampshire adults with current asthma were current smokers in 2004, compared to 21.5% (95% CI: 20.0-23.0) of adults with no asthma. In addition, 29.5% (95% CI: 25.1-33.8) of adults with current asthma reported being former smokers compared to 28.4% (95% CI: 26.9-29.8) of adults with no asthma. There are no statistically significant differences in smoking status among adults with and without current asthma in New Hampshire.

However nationally, 23.4% (95% CI: 22.3-24.5) of adults with current asthma were current smokers in 2004, compared to 20.5% (95% CI: 20.2-20.8) of adults with no asthma. Approximately 24.9% (95% CI: 23.9-25.9) of adults with asthma reported being former smokers compared to 23.2% (95% CI: 22.8-23.5) of adults with no asthma. Nationally, there is a statistically significant difference in smoking status among adults with and without current asthma (Source: BRFSS, 2004).

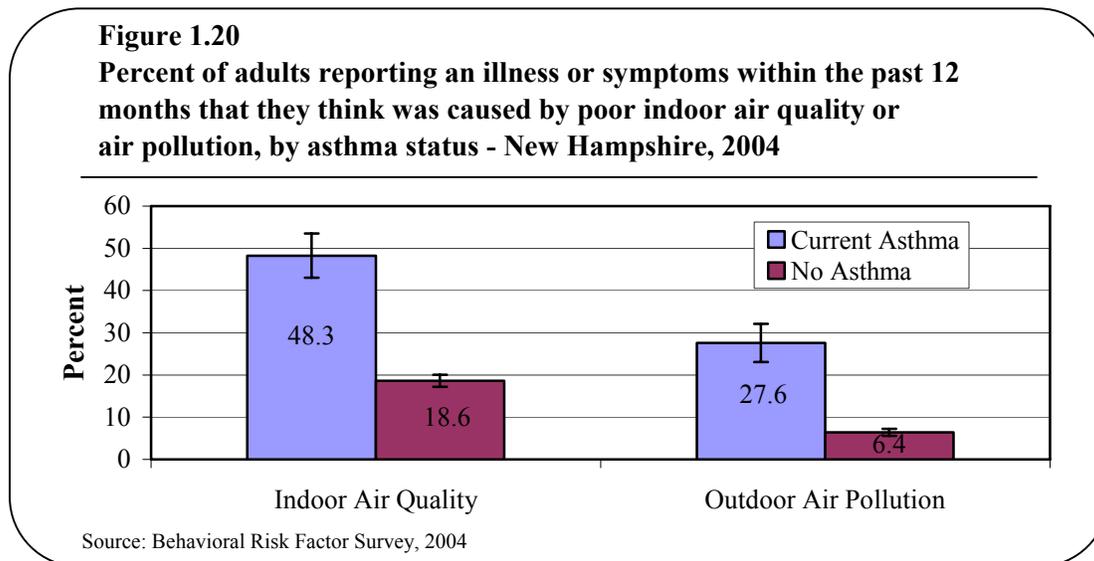
A *current smoker* is defined as a survey respondent who reported smoking at least 100 cigarettes in their lifetime and currently smokes every day or some days. A *former smoker* is defined as a respondent who reported smoking at least 100 cigarettes in their lifetime and no longer currently smokes. Respondents who *never smoked* reported not having smoked at least 100 cigarettes in their lifetime.

Table 1.11
Smoking status among adults, by asthma status –
New Hampshire, 2004

	Current Smoker			Former Smoker			Never Smoked		
	N	Percent	(95% CI)	N	Percent	(95% CI)	N	Percent	(95% CI)
Current Asthma	115	22.9	(18.3-27.4)	188	29.5	(25.1-33.8)	223	47.7	(42.4-52.9)
No Asthma	890	21.5	(20.0-23.0)	1404	28.4	(26.9-29.8)	2199	50.1	(48.4-51.9)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.20 compares the percent of adults in New Hampshire with and without current asthma who report illness or symptoms due to indoor air quality and outdoor air pollution.



Comment: In 2004, 48.3% (95% CI: 43.0-54.5) of New Hampshire adults with current asthma reported experiencing an illness or symptoms within the past 12 months that was caused by something in the air inside a home, office, or other building, compared to 18.7% (95% CI: 17.2-20.0) of adults without asthma. Poor indoor air quality was defined as being caused by dust, mold, smoke, and/or chemicals inside the home or office or other building, all of which can exacerbate asthma symptoms.

Outdoor air pollution was reported as a cause of an illness or symptoms that occurred within the past 12 months by 27.6% (95% CI: 23.0-32.1) of New Hampshire adults with current asthma compared to 6.4% (95% CI: 5.6-7.2) of adults without asthma. Outdoor air pollution was defined as smog, automobile exhaust, and/or chemicals; natural agents like pollen or dust in outdoor air were not considered outdoor air pollution. Ozone (found in smog) and particle pollution (found in haze, smoke, and dust) are outdoor air pollutants that can affect asthma.

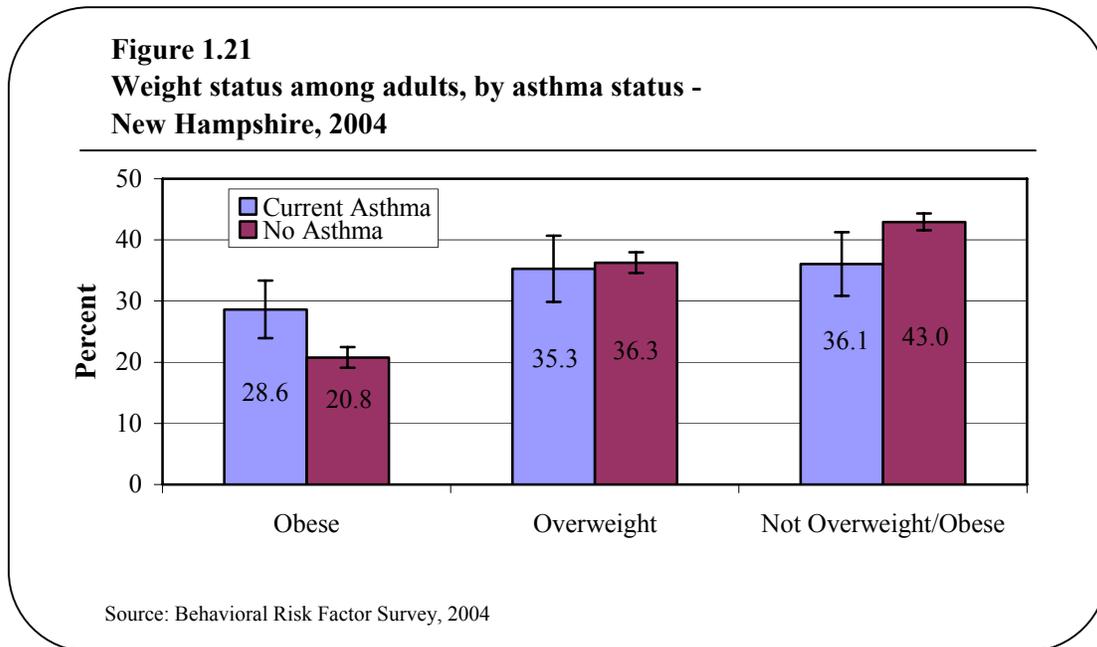
There is a statistically significant difference in reported illness or symptoms thought to be caused by both indoor air quality and outdoor air pollution, by asthma status.

Table 1.12
Percent of adults reporting an illness or symptoms within the past 12 months that they think was caused by poor indoor air quality or air pollution, by asthma status - New Hampshire, 2004

	Indoor Air Quality			Outdoor Air Pollution		
	N	Percent	(95% CI)	N	Percent	(95% CI)
Current Asthma	249	48.3	(43.0-54.5)	157	27.6	(23.0-32.1)
No Asthma	773	18.6	(17.2-20.0)	296	6.4	(5.6-7.2)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.21 compares the proportion of adults in New Hampshire with and without current asthma who are obese, overweight, and not overweight/obese.



Comment: Approximately 28.6% (95% CI: 23.9-33.4) of respondents with current asthma in New Hampshire were obese, compared to 20.8% (95% CI: 19.4-22.2) of adults without asthma. There is a statistically significant difference between adults with and without asthma who were obese. Further research is needed to understand the link between obesity and asthma when all factors are controlled for.

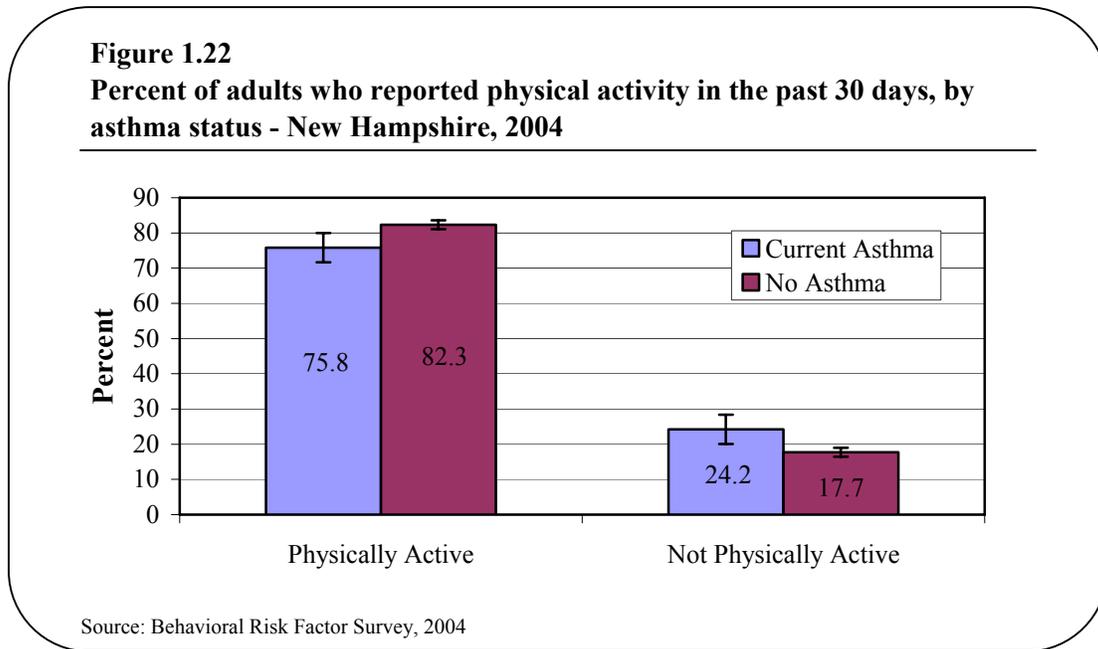
Obese is defined as a body mass index (BMI) greater than or equal to 30, and *overweight* is defined as a BMI greater than or equal to 25 and less than 30. BMI is calculated by dividing weight (measured in kilograms) by height squared (measured in meters). BRFSS data on weight and height are self-reported.

Table 1.13
Weight status among adults, by asthma status –
New Hampshire, 2004

	Obese		Overweight		Not Overweight/Obese	
	N	Percent (95% CI)	N	Percent (95% CI)	N	Percent (95% CI)
Current Asthma	150	28.6 (23.9-33.4)	154	35.3 (29.9-40.7)	177	36.1 (30.9-41.3)
No Asthma	903	20.8 (19.4-22.2)	1596	36.3 (34.6-37.9)	1820	43.0 (41.2-44.7)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.22 shows the percent of adults in New Hampshire with and without current asthma who participated in physical activity in the past 30 days.



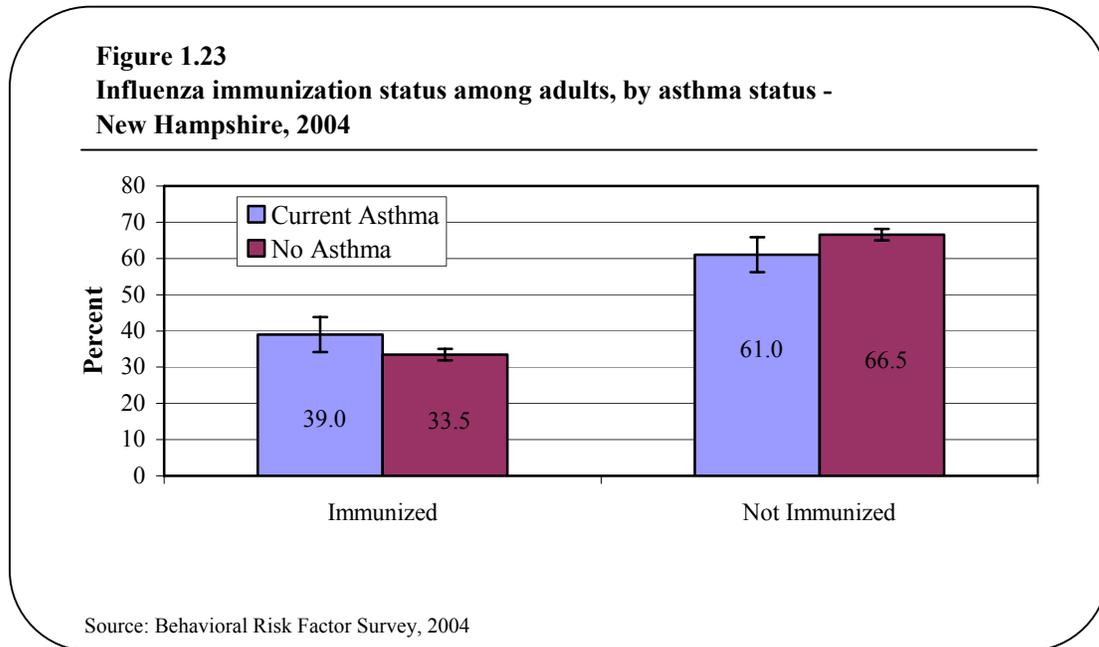
Comment: In 2004, 75.8% (95% CI: 71.7-80.0) of New Hampshire adults with current asthma reported participating in physical activity compared to 82.3% (95% CI: 81.0-83.5) of adults without asthma. There is a statistically significant difference in reported physical activity by asthma status.

Table 1.14
Percent of adults who reported physical activity in the past 30 days, by asthma status - New Hampshire, 2004

	Physically Active			Not Physically Active		
	N	Percent	(95%CI)	N	Percent	(95%CI)
Current Asthma	380	75.8	(71.7-80.0)	3644	24.2	(20.0-28.3)
No Asthma	148	82.3	(81.0-83.5)	861	17.7	(16.5-19.0)

Source: Behavioral Risk Factor Survey, 2004

Figure 1.23 shows influenza immunization status among adults in New Hampshire with and without current asthma.



Comment: The Centers for Disease Control and Prevention recommends that individuals with asthma receive an annual vaccination for influenza.⁷ In 2004, 39.0% (95% CI: 34.2-43.8) of New Hampshire adults with current asthma said they had received an influenza vaccination in the past 12 months, compared to 33.5% (95% CI: 31.9-35.0) of adults who did not have asthma. In comparison, approximately 42.9% (95% CI: 41.7-44.1) of adults in the US with current asthma reported receiving an influenza vaccination in the past 12 months.

The difference in influenza vaccination status among people in New Hampshire who have asthma and those who do not was not statistically significant.

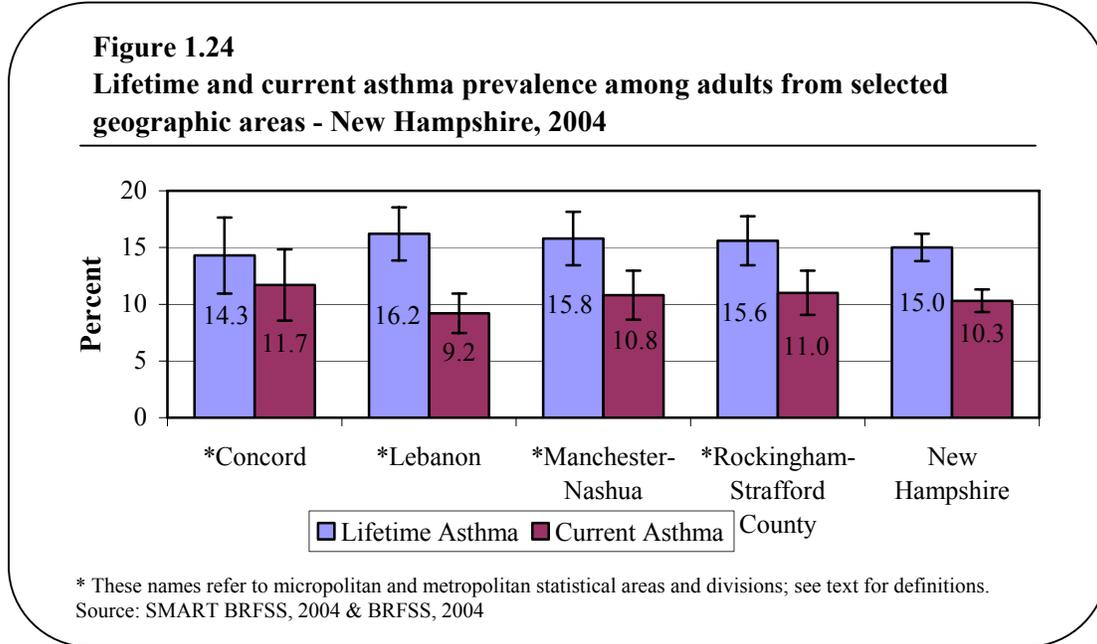
Table 1.15
Influenza immunization status among adults, by asthma status -
New Hampshire, 2004

	Immunized			Not Immunized		
	N	Percent	(95% CI)	N	Percent	(95% CI)
Current Asthma	238	39.0	(34.2-43.8)	289	61.0	(56.2-65.8)
No Asthma	1646	33.5	(31.9-35.0)	2859	66.5	(65.0-68.1)

Source: Behavioral Risk Factor Survey, 2004

Prevalence of Asthma by Selected Geographic Areas

Figure 1.24 shows the lifetime and current asthma prevalence among adults from selected geographic areas in New Hampshire. The source of these data are the 2004 SMART BRFSS and BRFSS.



Comment: There are no apparent differences between the selected geographic areas and the state level for lifetime and current asthma prevalence.

Definitions of above geographic areas:

- ❖ Concord, NH Micropolitan Statistical Area
Includes: Merrimack County, NH
- ❖ Lebanon, NH-VT Micropolitan Statistical Area
Includes: Grafton County, NH; Orange County, VT; and Windsor County, VT
- ❖ Manchester-Nashua, NH Metropolitan Statistical Area
Includes: Hillsborough County, NH
- ❖ Rockingham County-Strafford County, NH Metropolitan Division
Includes: Rockingham County, NH; and Strafford County, NH

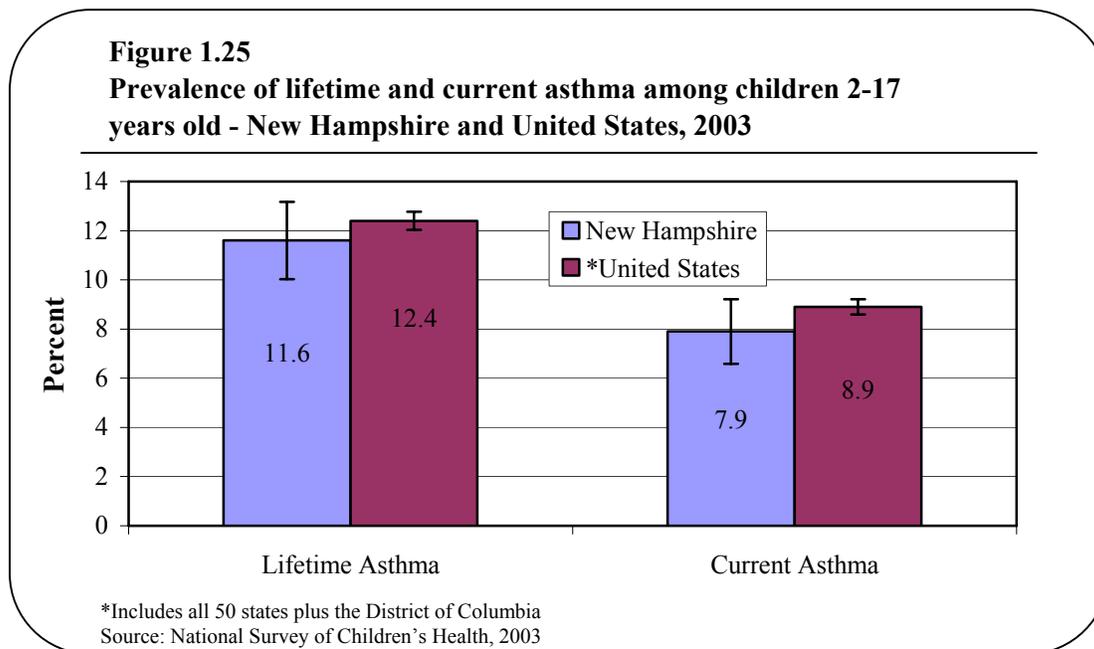
Table 1.16
Lifetime and current asthma prevalence among adults from selected geographic areas - New Hampshire, 2004

Geographic Areas	Lifetime Asthma			Current Asthma		
	N	Percent	(95%CI)	N	Percent	(95%CI)
Concord, NH Micropolitan Statistical Area	84	14.3	(11.0-17.7)	64	11.7	(8.6-14.9)
Lebanon, NH-VT Micropolitan Statistical Area	217	16.2	(13.9-18.6)	133	9.2	(7.5-11.0)
Manchester-Nashua, NH Metropolitan Statistical Area	217	15.8	(13.5-18.2)	151	10.8	(8.7-13.0)
Rockingham County- Strafford County, NH Metropolitan Division	230	15.6	(13.5-17.8)	158	11.0	(9.0-12.9)
New Hampshire	762	15.0	(13.8-16.2)	528	10.3	(9.3-11.3)

Source: SMART BRFSS, 2004 and BRFSS, 2004

Asthma in Children

Data from figure 1.25 and table 1.17 are from the 2003 National Survey of Children’s Health – not the BRFSS. Figure 1.25 shows the prevalence of lifetime and current asthma among children 2-17 years old in New Hampshire compared to the United States.



Comment: In 2003, 11.6% (95% CI: 10.0-13.2) of New Hampshire children 2-17 years old were reported as being told they had asthma at some time in their life, and approximately 7.9% (95% CI: 6.6-9.2) of children 2-17 years were reported as having current asthma.

Lifetime asthma prevalence among children 2-17 years for the United States was 12.4% (95% CI: 12.0-12.8) and current asthma prevalence was 8.9% (95% CI: 8.5-9.2). The median lifetime and current asthma prevalence estimates for children 2-17 years in the US was 12.2% (range: 8.1-17.1) and 8.7% (range: 5.7-11.9).

Table 1.17
Prevalence of lifetime and current asthma among children 2-17 years old - New Hampshire and United States, 2003

	Lifetime Asthma		Current Asthma	
	Percent	(95% CI)	Percent	(95% CI)
New Hampshire	11.6	(10.0-13.2)	7.9	(6.6-9.2)
*United States	12.4	(12.0-12.8)	8.9	(8.5-9.2)

*Includes all 50 states plus the District of Columbia
 Source: National Survey of Children’s Health, 2003

2. INPATIENT HOSPITALIZATION FOR ASTHMA

Data on inpatient hospital stays for asthma can be used to examine the severity of asthma, both from the perspective of the individual and society. In 2004, approximately 497,000 hospitalizations for asthma occurred in the United States (National Hospital Discharge Survey, 2004). In 1994, the most recent year for which national cost estimates are available charges for asthma inpatient hospital care were approximately 1.8 billion dollars.⁸ Most, if not all, hospitalizations for asthma can be prevented if the disease is managed according to established guidelines. As a result, public health action to reduce the number of hospitalizations for asthma can result in significant reductions in asthma morbidity and overall burden to society.

Due to the fact that asthma inpatient hospitalization rates measure a severe and relatively infrequent outcome of the disease, they are not useful indicators of asthma prevalence in the population. Hospitalization data are still a good source of information for asthma surveillance, however, because the information may help identify specific population groups at greater risk of significant morbidity and mortality due to asthma. Such groups can then be targeted for interventions to prevent hospitalization.

This section presents data on inpatient hospitalizations for asthma in New Hampshire from 1996 to 2004. It addresses questions such as: what are the annual number and rate of asthma hospitalizations, how have asthma hospitalization rates changed over time, and do asthma hospitalizations vary by gender, age group, or season of the year? New Hampshire data are compared to both state and national objectives for asthma hospitalization rates to assess our progress toward meeting these goals. In order to provide a more complete picture of the burden of asthma in the state, data on length of stay and charges associated with asthma hospitalizations are also included.

There is no confirmed asthma case classification for hospital discharge data. A probable case is defined as a hospital record listing asthma as the primary discharge diagnosis.⁹ Discharge data represent the number of *hospitalizations* rather than the number of *persons* hospitalized, and multiple hospitalizations by an individual are recorded as separate events. For this report, an asthma hospitalization was defined as an inpatient hospital data set record of a New Hampshire resident listing asthma (ICD-9 CM code 493.0-493.9) as the principal discharge diagnosis. New Hampshire residents hospitalized in another state are not included; therefore, the true asthma-related hospitalization rate for New Hampshire residents is probably higher.

METHODS

DEFINITIONS:

Principal diagnosis of asthma refers to discharges with a principal discharge diagnosis of asthma (ICD-9 CM code 493.0-493.9).

Underlying diagnosis of asthma refers to discharges with a secondary discharge diagnosis of asthma (ICD-9 CM code 493.0-493.9). A discharge can have up to 8 secondary diagnoses. If a discharge has one or more secondary diagnoses of asthma, then it is classified as having an underlying diagnosis of asthma. Discharges that have both a primary and secondary diagnosis of asthma are classified only as having a primary diagnosis of asthma; they are not classified as having an underlying diagnosis of asthma.

Charges include both facility and physician charges when the physician is paid through the hospital; as a result charges do not capture all charges associated with all hospitalizations because some physicians are not paid through the hospital.

DATA SOURCES AND QUALITY OF DATA:

Inpatient Hospital Discharge Data

Inpatient Hospital Discharge Data (IHDD) are used when comparing the rate of asthma hospitalizations to Healthy 2010 objectives and national rates by age and gender. Data on all New Hampshire hospitalizations are abstracted from medical records upon patient discharge and submitted electronically to the Maine Health Information Center, which is under contract with the Department of Health and Human Services (DHHS) to collect the data. The inpatient data set contains discharge records on admissions for stays of 24 hours or more at all 26 acute-care, non-federal, inpatient facilities in the state. Hospitalization data are coded under the Ninth Revision of the International Classification of Diseases-Clinical Modification (ICD-9-CM).

IHDD are required by law to be reported to the DHHS. Since the data set is an administrative data source, there are very few missing values. There is no missing demographic information, although approximately 3% of race/ethnicity is characterized as unknown. This is an issue when trying to stratify the data by race/ethnicity. The overall data quality of IHDD is considered high.

One area of concern with IHDD, however, is reporting of data on patients who seek care outside of New Hampshire. There is an agreement between New Hampshire and its neighboring states to report hospital discharge data back to the state where the patient legally resides. However, there is a two to three year lag between the date of hospitalization and when data are reported to DHHS. Approximately 15% (percent per town varied from 94% to 0%) of inpatient hospital discharges among New Hampshire residents occur outside the state, with most of these hospitalizations occurring in Massachusetts. Due to the extended time lag in getting data from other states, only hospitalizations that occur within New Hampshire are reported. This results in an under-reporting of hospitalization rates and impacts sub-state comparisons.

This report contains data on asthma inpatient hospitalizations from 1996-2004. Additional information about New Hampshire hospital discharge data is available on-line at: <http://www.dhhs.nh.gov/DHHS/HSDM/Hospital-Discharge-Data.htm>

National Hospital Discharge Survey

The *National Hospital Discharge Survey* (NHDS) has been conducted annually since 1965. It collects data from approximately 270,000 randomly selected inpatient records from a national sample of approximately 500 hospitals. Because NHDS looks at only a sample of records, the estimates obtained could be different than if all hospitalization records were used; however, the standard error and 95% confidence intervals should account for most of the variability in the estimates due to sampling errors. The data from NHDS are publicly available on-line at: <http://www.cdc.gov/nchs/about/major/hdasd/nhds.htm>

Healthy People 2010

Healthy People 2010 is a set of national health targets to be met by 2010. It builds on initiatives pursued over the past two decades, including those reported in the *1979 Surgeon General's Report, Healthy People*, and *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*. It is designed to achieve two overarching goals: 1) increase quality and years of healthy life, and 2) eliminate health disparities. Eight *Healthy People 2010* objectives address asthma (see Appendix B). A copy of *Healthy People 2010* can be obtained on-line at: <http://www.health.gov/healthypeople/>.

Healthy New Hampshire 2010

Healthy New Hampshire 2010 is New Hampshire's health promotion and disease prevention agenda for the first decade of the 21st century. Similar to *Healthy People 2010*, it is a compilation of health objectives to be met by 2010. *Healthy New Hampshire 2010* has one asthma-related objective: to reduce pediatric hospitalizations for asthma (see Appendix B). A copy of *Healthy New Hampshire 2010* can be obtained on-line at: <http://www.healthynh2010.org/>.

ANALYSIS:

SAS and SAS-Callable SUDAAN 9.0 were used to conduct analyses using Inpatient Hospital Discharge Data and data from the National Hospital Discharge Survey.

National Comparisons

The *National Hospital Discharge Survey* is used to obtain the rate of hospitalization for asthma nationally and the analysis is stratified by race. New Hampshire rates are compared to rates for the US white population rather than to overall US rates due to the relatively small minority population in the state compared to the US. Minorities represent 4% of New Hampshire's population, whereas nationally minorities represent 25% of the population. Where appropriate,

asthma-related objectives from *Healthy People 2010* or *Healthy New Hampshire 2010* are presented to put current asthma data from New Hampshire in perspective.

Age-Adjusted Rates

In some tables, both crude rates and age-adjusted rates are presented. The crude rate is calculated by dividing the number of events by the state's population. Because the events of interest (e.g., hospitalizations and deaths) are more common as a person ages, the crude rate can be affected by the age structure of a population. To control for the effect of age, rates are adjusted using the direct method and the 2000 United States standard population. The age-adjusted rate allows for more meaningful analysis when comparing data between states or when looking at trends in a single state over time. Appendix C gives the formulas used to calculate age-adjusted rates.

Numerators for Rate Calculations

Numerators for rate calculations include New Hampshire residents hospitalized in-state; residents of other states who were hospitalized in New Hampshire are excluded as are residents of New Hampshire hospitalized out-of-state.

Denominators for Rate Calculations

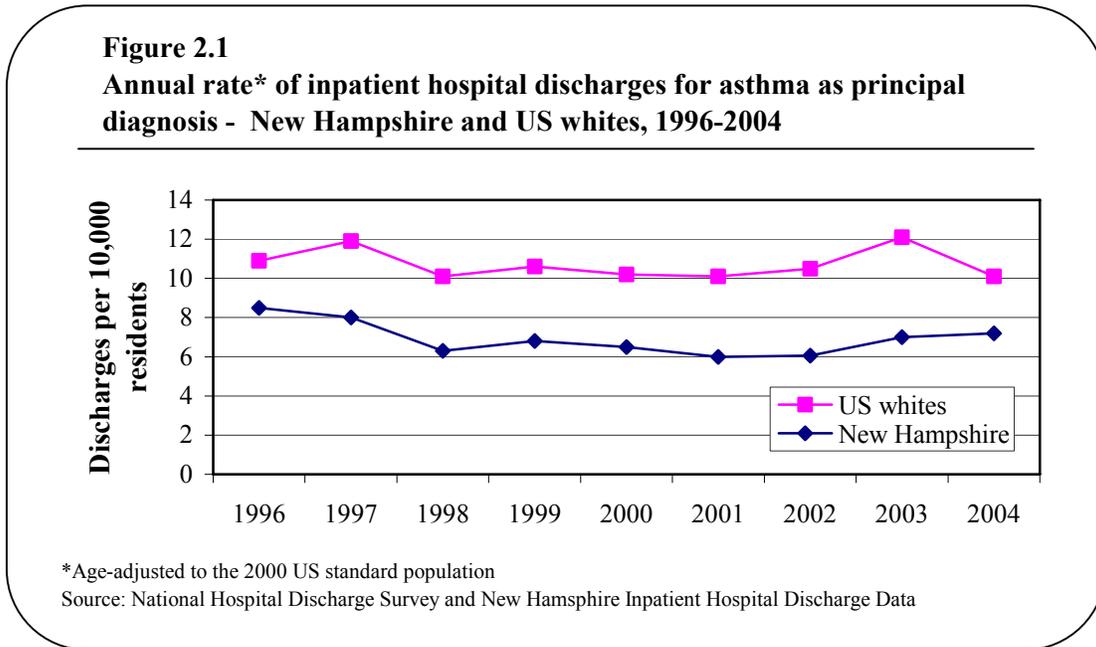
Intercensal population estimates were obtained from the US Census. (Table ST-99-8: Population Estimates for the US, Regions, Divisions, and States by 5 year Age Groups and Sex: Time Series Estimates, July 1, 1990 to July 1, 1999 and April 1, 1990 Census Population Counts).¹⁰ For Table 2.2 and 2.3, population estimates were extrapolated by taking the difference between the 1990 and 2000 population estimates, dividing it by ten to obtain a yearly increment, and adding multiples of this amount to the 1990 population to obtain estimates for 1991-1999. This was done because more accurate US Census data stratified by sex and age were difficult to find when these data were originally analyzed. To be consistent with the previous reports, rates were not recalculated.

Population estimates for 2000-2004 were obtained from the US Census Bureau. (Table 2: Annual Estimates of the Population by Sex and Age for New Hampshire: April 1, 2000 to July 1, 2004 (SC-EST2004-02-33)).¹¹

Confidence Intervals

Although these data are not from a survey and all hospitalizations in the state have been captured, confidence intervals still serve a purpose. The confidence intervals help to determine if the different rates seen from year to year are due to expected fluctuations based on the number of discharges and the size of the population or if they are statistically different from one year to the next. Appendix C gives the formulas used to calculate 95% confidence intervals.

Figure 2.1 compares the annual rate of inpatient hospital discharges for asthma in New Hampshire to the national rate among whites.



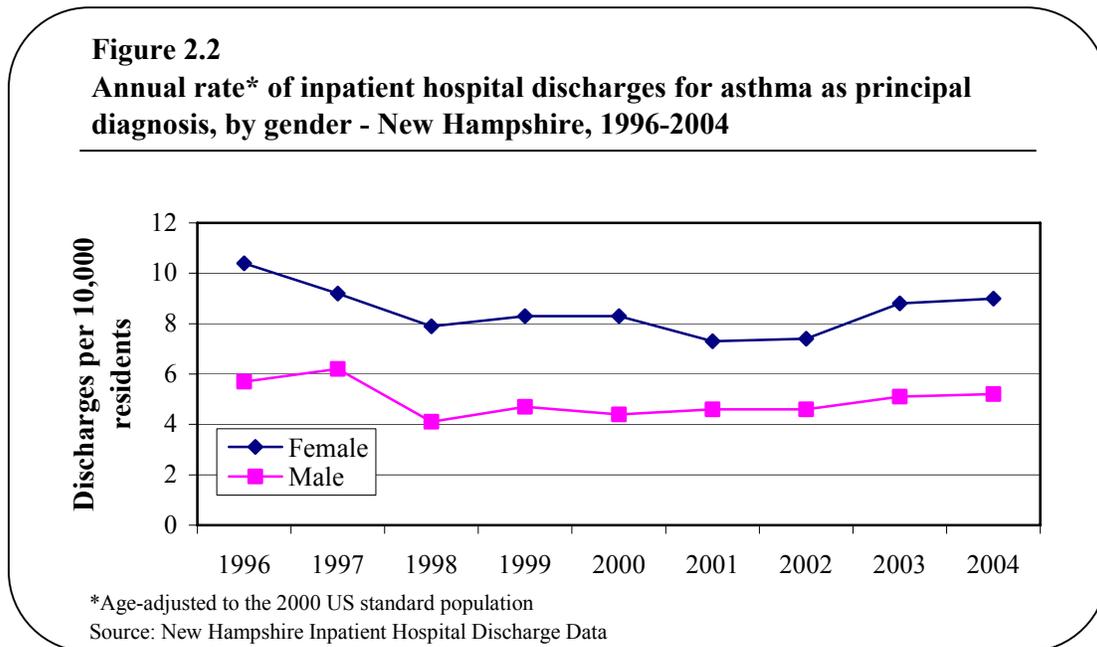
Comment: The age-adjusted rate of inpatient hospitalizations for asthma among New Hampshire residents was 7.2 per 10,000 in 2004. Although New Hampshire’s rate of inpatient hospital discharges has increased from 2001-2004, it appears to be consistently lower than the national rate from 1996-2004.

Table 2.1
Annual number and rate* of inpatient hospital discharges for asthma as principal diagnosis – New Hampshire, 1996-2004

	Number	Crude Rate	Age-Adjusted**Rate	95% CI
1996	956	8.2	8.5	7.9-9.0
1997	924	7.9	8.0	7.5-8.5
1998	732	6.2	6.3	5.9-6.8
1999	800	6.7	6.8	6.3-7.2
2000	796	6.4	6.5	6.0-6.9
2001	752	6.0	6.0	5.6-6.5
2002	765	6.0	6.1	5.6-6.5
2003	901	7.0	7.0	6.6-7.5
2004	940	7.2	7.2	6.7-7.7

*Rates are per 10,000 residents. Only New Hampshire residents hospitalized in the state are included. **Age-adjusted to the 2000 US standard population.
 Source: New Hampshire Inpatient Hospital Discharge Data

Figure 2.2 compares the annual rate of inpatient hospital discharges for asthma in New Hampshire by gender.



Comment: Females have a higher rate of inpatient hospitalization for asthma than males, both in New Hampshire and nationally. This pattern of gender difference in asthma hospitalizations has been consistent over time; female rates exceeded male rates, with female rates about 73% higher than male rates. In 2004, the rate for females was 9.0 per 10,000 versus 5.2 per 10,000 for males.

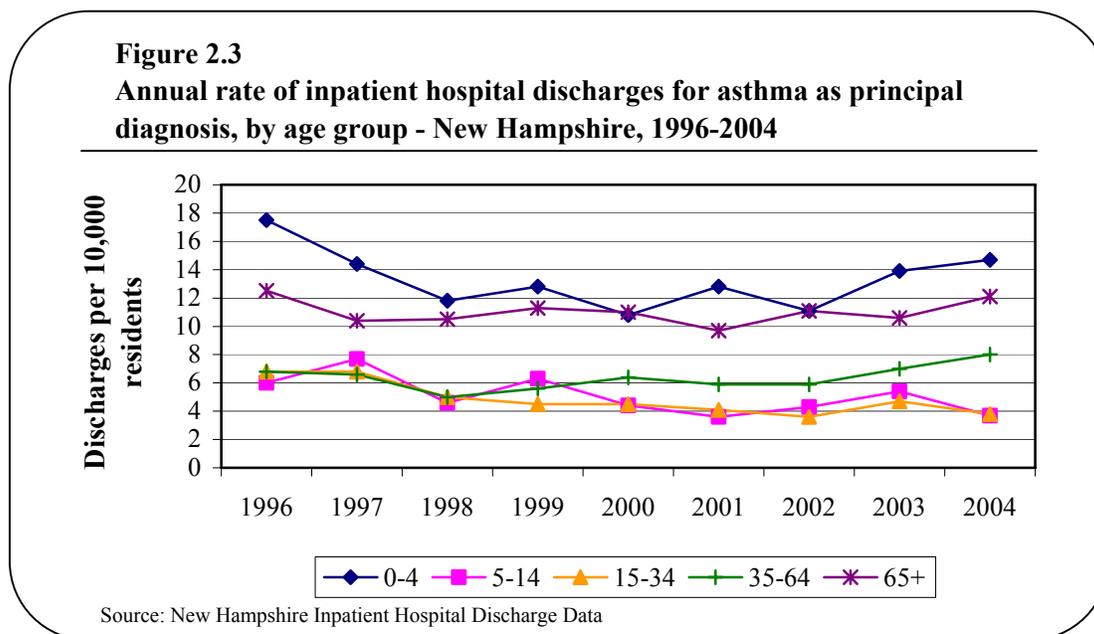
Since 2001, the rate of asthma hospitalization appears to have increased for both males and females.

Table 2.2
Annual number and rate* of inpatient hospital discharges for asthma as principal diagnosis, by gender – New Hampshire, 1996-2004

	Male			Female			Total		
	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI
1996	323	5.7	5.1-6.3	633	10.4	9.6-11.2	956	8.5	7.9-9.0
1997	357	6.2	5.5-6.8	567	9.2	8.5-10.0	924	8.0	7.5-8.5
1998	238	4.1	3.6-4.6	494	7.9	7.2-8.6	732	6.3	5.9-6.8
1999	274	4.7	4.1-5.3	526	8.3	7.6-9.1	800	6.8	6.3-7.2
2000	261	4.4	3.9-5.0	535	8.3	7.6-9.0	796	6.5	6.0-6.9
2001	279	4.6	4.1-5.2	473	7.3	6.6-7.9	752	6.0	5.6-6.5
2002	274	4.6	4.0-5.1	491	7.4	6.7-8.0	765	6.1	5.6-6.5
2003	310	5.1	4.5-5.6	591	8.8	8.1-9.5	901	7.0	6.6-7.5
2004	318	5.2	4.6-5.8	622	9.0	8.3-9.7	940	7.2	6.7-7.7

*Rates are per 10,000 residents and age-adjusted to the 2000 US standard population. Only New Hampshire residents hospitalized in the state are included.
 Source: New Hampshire Inpatient Hospital Discharge Data

Figure 2.3 shows the annual rate of asthma hospitalizations in New Hampshire by age group.



Comment: Rates of inpatient hospitalization for asthma in New Hampshire are highest among children 0 to 4 years of age and adults 65 years and older. The relatively high rates of hospitalization for asthma among adults aged 65 and older may be partly explained by the fact that older individuals are more likely to have other conditions such as chronic obstructive pulmonary disease (COPD) that may be incorrectly classified as asthma on the hospital discharge record. Nationally, children aged 0 to 4 have the highest rates of hospitalization for asthma.

Hospitalization rates have increased among children 0-4 years and adults 35 to 64 years from 2002 to 2004.

Asthma is one of the most frequent causes of hospitalization among New Hampshire children. Approximately 11.5% of all discharges among children 1-4 years list asthma as the primary diagnosis – data not shown (source: New Hampshire Inpatient Hospital Discharge Data, 2004).

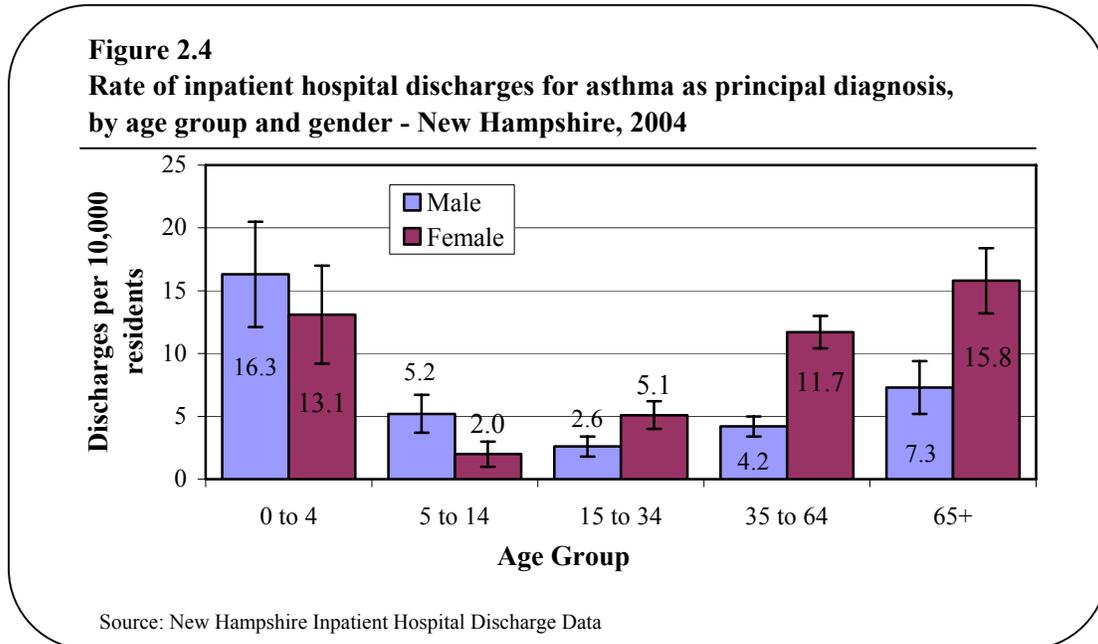
Table 2.3
Annual number and rate* of inpatient hospital discharges for asthma as principal diagnosis, by age group – New Hampshire, 1996-2004

	0-4			5-14			15-34			35-64			65+			Total**		
	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI
1996	139	17.5	14.4-20.6	102	6.0	4.8-7.2	229	6.8	5.9-7.7	312	6.8	6.0-7.5	174	12.5	10.7-14.4	956	8.5	7.9-9.0
1997	113	14.4	11.5-17.3	128	7.4	6.1-8.7	225	6.8	5.9-7.7	312	6.6	5.8-7.3	146	10.4	8.7-12.1	924	8.0	7.5-8.5
1998	91	11.8	9.5-14.5	81	4.6	3.7-5.7	163	5.0	4.3-5.8	246	5.0	4.4-5.7	151	10.5	8.8-12.2	732	6.3	5.9-6.8
1999	98	12.8	10.4-15.6	112	6.3	5.1-7.5	145	4.5	3.8-5.2	280	5.6	4.9-6.3	165	11.3	9.6-13.1	800	6.8	6.3-7.2
2000	82	10.8	8.6-13.4	80	4.4	3.5-5.5	141	4.5	3.7-5.2	331	6.4	5.7-7.1	162	11.0	9.3-12.7	796	6.5	6.0-6.9
2001	98	12.8	10.4-15.6	66	3.6	2.8-4.6	132	4.1	3.4-4.8	311	5.9	5.3-6.5	145	9.7	8.1-11.2	752	6.0	5.6-6.5
2002	81	11.1	8.8-13.8	77	4.3	3.4-5.4	116	3.6	2.9-4.3	322	5.9	5.2-6.5	169	11.1	9.4-12.8	765	6.1	5.6-6.5
2003	101	13.9	11.1-16.7	95	5.4	4.4-6.6	152	4.7	3.9-5.4	389	7.0	6.3-7.7	164	10.6	9.0-12.2	901	7.0	6.6-7.5
2004	107	14.7	11.9-17.6	64	3.7	2.8-4.7	126	3.8	3.2-4.5	453	8.0	7.3-8.7	190	12.1	10.4-13.9	940	7.2	6.7-7.7

*Rates are per 10,000 population. Only includes NH residents hospitalized in NH. **Rates for the total are age-adjusted.

Source: New Hampshire Inpatient Hospital Discharge Data

Figure 2.4 compares the rate of inpatient hospital discharges for asthma in New Hampshire in 2004, by age group and gender.



Comment: The likelihood of hospitalization for asthma varied considerably by both age and gender. Males aged 0 to 14 years had higher rates of asthma hospitalization than females. Females had higher rates after age 14, and the difference between male-female rates increased with age. This age-gender difference has been shown in numerous studies and is more readily apparent with severe outcomes of asthma (e.g., hospitalization and death).¹⁵

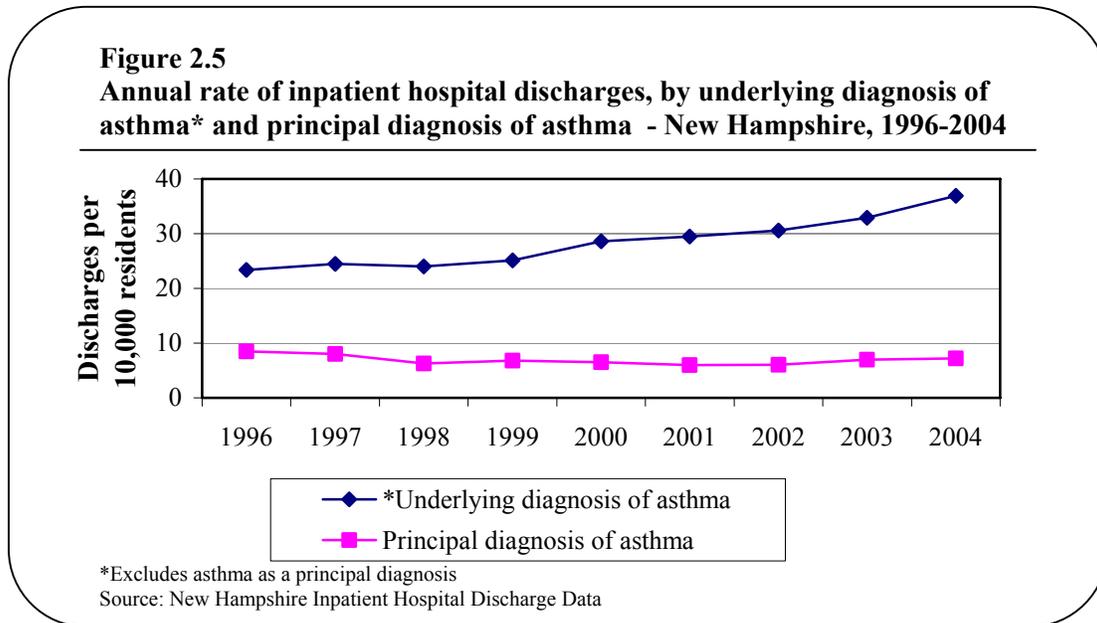
Table 2.4.
Number and rate* of inpatient hospital discharges for asthma as principal diagnosis, by age group and gender –New Hampshire, 2004

Gender		0-4	5-14	15-34	35-64	65+
Male	N	61	47	43	118	49
	Rate	16.3	5.2	2.6	4.2	7.3
	95% CI	12.5-20.9	3.8-6.9	1.9-3.5	3.4-5.0	5.4-9.7
Female	N	46	17	83	335	141
	Rate	13.1	2.0	5.1	11.7	15.8
	95% CI	9.6-17.5	1.2-3.2	4.1-6.3	10.4-13.0	13.2-18.4

*Rates are per 10,000 population. Only NH residents hospitalized in NH are included.

Source: New Hampshire Inpatient Hospital Discharge Data

Figure 2.5 compares the annual rate of inpatient hospital discharges for asthma in New Hampshire, by underlying and principal diagnosis.



Comment: The underlying diagnosis of asthma has increased 57.7% since 1996. Note that a person with a principal diagnosis of a broken arm could have an underlying diagnosis of asthma.

Further analysis is needed to determine what the rise in underlying diagnosis is due to: a change in billing and coding practices, increased awareness of asthma, the increased prevalence of asthma, or other factors.

Table 2.5
Annual number and rate* of inpatient hospital discharges, by underlying diagnosis of asthmaand principal diagnosis of asthma – New Hampshire, 1996-2004**

	**Underlying diagnosis of asthma			Principal diagnosis of asthma		
	N	Rate	95% CI	N	Rate	95% CI
1996	2657	23.4	22.5 - 24.3	956	8.5	7.9 - 9.0
1997	2837	24.5	23.6 - 25.4	924	8.0	7.5 - 8.5
1998	2810	24.0	23.1 - 24.9	732	6.3	5.9 - 6.8
1999	2976	25.1	24.1 - 26.0	800	6.8	6.3 - 7.2
2000	3548	28.6	27.7 - 29.6	796	6.5	6.0 - 6.9
2001	3713	29.5	28.5 - 30.4	752	6.0	5.6 - 6.5
2002	3932	30.6	29.6 - 31.5	765	6.1	5.6 - 6.5
2003	4294	32.9	31.9 - 33.9	901	7.0	6.6 - 7.5
2004	4869	36.9	35.8 - 37.9	940	7.2	6.7 - 7.7

*Rates are per 10,000 residents and age-adjusted to 2000 US standard population. Only New Hampshire residents hospitalized in the state are included. **Excludes those with asthma as a principal diagnosis.
 Source: New Hampshire Inpatient Hospital Discharge Data

Table 2.6 compares New Hampshire inpatient hospitalization rates for 2001 and 2004 with national and state 2010 objectives by age group.

Table 2.6
Comparison of New Hampshire inpatient hospitalization rates* and 2010 objectives, by age group

	2001 NH Rate	2004 NH Rate	2010 Target
Age Group			US Healthy People
0 to 4	12.8	14.7	25
5 to 64	4.9	6.0	7.7
≥65	9.7	12.1	11
			Healthy NH
0 to 17	8.8	9.3	7.9

*Rates are per 10,000 residents

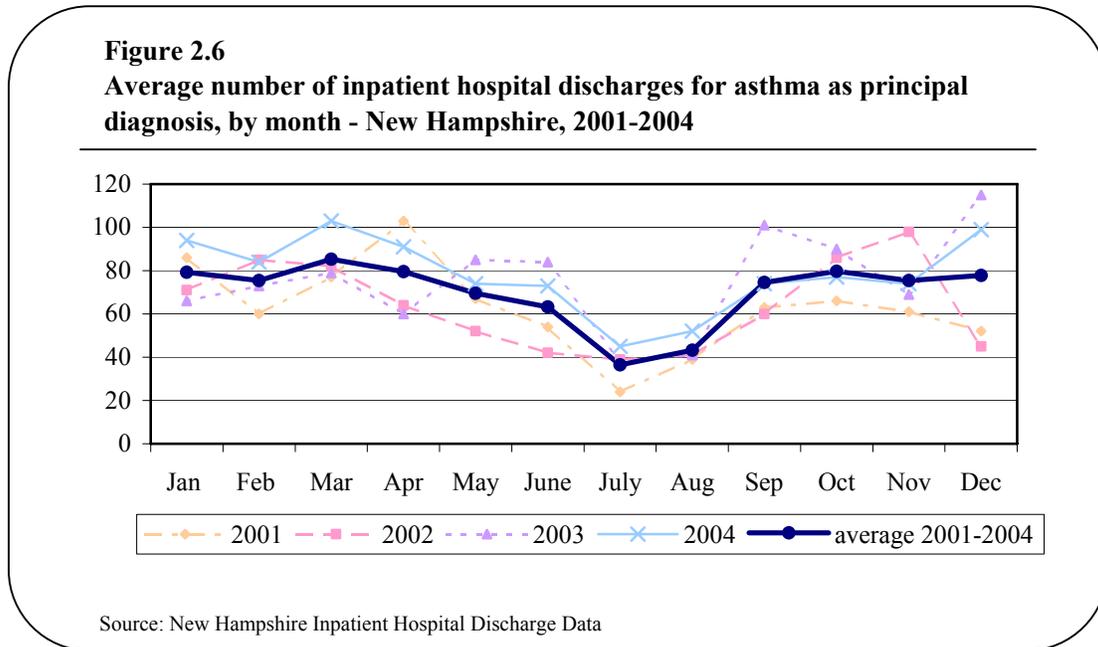
Source: New Hampshire Inpatient Hospital Discharge Data

Comment: Both the *US Healthy People 2010* and *Healthy New Hampshire 2010* initiatives include objectives that address hospitalization for asthma. *Healthy People 2010* Objective 24-2 is to reduce asthma hospitalizations to 25 per 10,000 among children 0 to 4 years of age, 7.7 per 10,000 among persons aged 5 to 64, and 11 per 10,000 among persons 65 and older.¹ These target rates use hospitalizations with a primary discharge diagnosis of asthma for the numerator and resident population from the US Census for the denominator.

New Hampshire hospitalization rates among those 0 to 4 and 5 to 64 are below *Healthy People 2010* target goals; however, these rates have increased since 2001. In 2004, New Hampshire did not meet the *Healthy People 2010* target for those 65 years and older.

Healthy New Hampshire 2010 includes an objective to reduce hospitalizations for pediatric asthma to 7.9 per 10,000. This target rate uses hospitalizations with either a primary discharge diagnosis of asthma (ICD-9 code 493) OR a primary discharge diagnosis of a respiratory condition (ICD-9 codes 460-496.9) with asthma as a second or third-listed diagnosis for the numerator. Pediatric asthma hospitalizations are defined as those that occur among persons 0 to 17 years of age.¹³ The pediatric asthma hospitalization rate for New Hampshire in 2004 was 9.3 per 10,000, an increase from 2001 and over the *Healthy New Hampshire 2010* target. A complete list of asthma-related *Healthy People 2010* and *Healthy New Hampshire 2010* objectives can be found in Appendix B.

Figure 2.6 shows the average number of inpatient hospital discharges for asthma in New Hampshire by month and year.



Comment: The number of hospitalizations for asthma in New Hampshire fluctuates over the course of a year. The largest number of hospitalizations tends to occur in the early spring and fall, January through April and September through December, with a rapid increase from August to September. The rapid increase in hospitalizations between August and September was consistently observed from 1996-2004. The smallest number of hospitalizations occurred from July to August.

Further research is needed to determine what seasonal variations in hospitalization are due to: the presence of seasonal allergens such as pollen; increased amounts of time spent indoors with exposure to potential triggers such as dust mites, mold, and environmental tobacco smoke; a greater frequency of upper respiratory infections; or other factors.

Table 2.7 shows charges and length of stay for asthma inpatient hospitalizations in New Hampshire from 1996-2004.

Table 2.7
Charges and length of stay (LOS) for asthma inpatient hospitalizations –
New Hampshire, 1996-2004

	Charges (dollars*)				LOS (days)		
	N	Mean	Median	Total	Mean	Median	Total
1996	956	4535	3447	4,335,149	3.5	3.0	3318
1997	924	4508	3510	4,165,209	3.1	2.0	2878
1998	732	4757	3634	3,481,980	3.2	3.0	2350
1999	800	4971	3850	3,976,751	3.1	2.0	2476
2000	796	5203	4095	4,141,661	3.1	2.0	2436
2001	752	5599	4356	4,210,196	3.2	2.0	2412
2002	765	7200	5245	5,507,865	3.3	3.0	2555
2003	901	7287	5630	6,565,769	3.2	3.0	2877
2004	940	8719	6246	8,195,996	3.5	3.0	3317

*Unadjusted dollars

Source: New Hampshire Inpatient Hospital Discharge Data

Comment: In 2004, there were 940 inpatient hospitalizations for asthma, resulting in 3,317 hospital days and charges of approximately 8.2 million dollars. The median length of stay for an asthma hospitalization was 3 days and the median charge was \$6,246. The median charge for inpatient hospitalizations has increased by 52.5% or \$2,151 from 2000 to 2004 and total charges have nearly doubled.

Charges for inpatient hospitalizations include both facility and physician charges only when the physician is paid through the hospital; this results in an under-reporting of the charges submitted to payors for a hospital stay.

In 1998, the estimated cost of asthma in New Hampshire was 46 million dollars. This was composed of an estimated 26 million dollars in direct medical expenditures and 20 million dollars in indirect costs.⁴ Direct medical expenditures include charges for hospitalization, outpatient/emergency department hospital services, physician services, and medications. Indirect costs of asthma include non-medical economic losses such as days missed from school or work, caregiver costs, travel costs, early retirement due to disability, and years of productive life lost due to premature death.¹

Table 2.8 shows charges and length of stay for asthma inpatient hospitalizations in New Hampshire in 2004, by age group.

Table 2.8
Charges and length of stay (LOS) for asthma inpatient hospitalizations,
by age group - New Hampshire, 2004

Age Group	N	Charges (dollars*)			LOS (days)		
		Mean	Median	Total	Mean	Median	Total
0-4	107	4,021	3,628	430,239	1.9	2	203
5-14	64	4,258	3,689	272,481	2.1	2	134
15-34	126	7,642	5,620	962,919	2.6	2	329
35-64	453	8,955	6,583	4,056,826	3.6	3	1,635
65+	190	13,019	9,580	2,473,531	5.3	4	1,016
Total	940	8,719	6,246	8,195,996	3.5	3	0

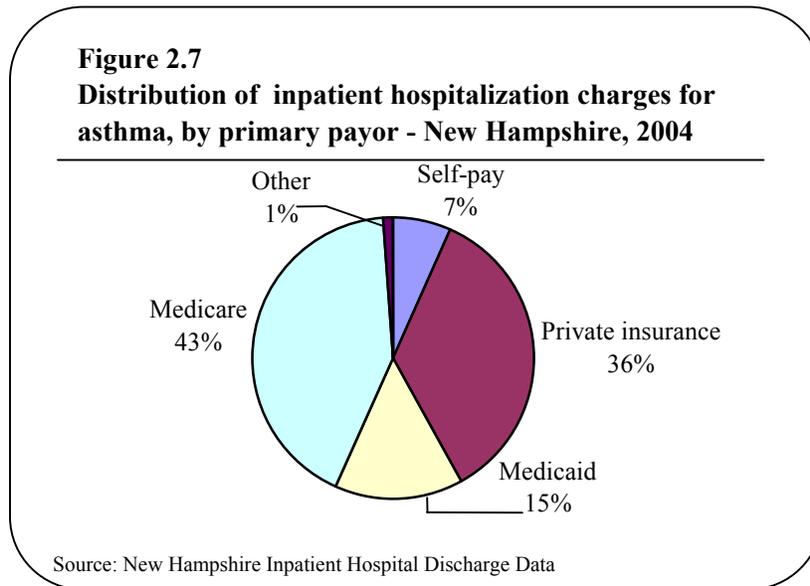
*Unadjusted dollars

Source: New Hampshire Inpatient Hospital Discharge Data

Comment: As age increases so do the mean and median charges and length of stay for asthma inpatient hospitalizations.

Charges for asthma hospitalizations among 35-64 year olds appear to be driven by volume, while those for individuals aged 65 and older appear to be due to length of stay. The length of stay particularly among those 65 years and older may be extended due to asthma severity, co-morbidities, and complications.

Figure 2.7 shows the distribution of inpatient hospitalization charges for asthma in New Hampshire in 2004, by primary payor.



Comment: A primary payor is the principal source from which a hospital expects to receive payment for charges incurred from a hospitalization. The information on primary payor in the New Hampshire inpatient hospital data set is divided into eleven categories. For the purposes of this analysis, these were grouped into the following five categories: Private (HMO, Blue Cross or commercial insurance), Medicaid (Medicaid or Medicaid Managed Care), Medicare (Medicare or Medicare Managed Care), Self-pay, and Other (Worker’s Compensation, Other government, or Other).

In 2004, Medicare was the expected primary payor for 42.6% of inpatient hospital charges for asthma in New Hampshire with charges of approximately 3.5 million dollars. Private insurance was the primary payor for 35.7% of hospital charges, Medicaid accounted for 14.7% of charges, and self-pay accounted for 6.6%. In 2001, Medicare was the primary payor for 36.1% of hospital charges due to asthma.¹⁴

Table 2.9
Inpatient hospitalization charges for asthma, by primary payor – New Hampshire, 2004

Payor	Number of hospitalizations	Charges (dollars*)	Percent of total charges
Self-pay	90	537,950	6.6
Private insurance	408	2,926,836	35.7
Medicaid	154	1,202,012	14.7
Medicare	281	3,490,961	42.6
Other	7	38,237	0.5
Total	940	8,195,996	100

*Unadjusted dollars

Source: New Hampshire Inpatient Hospital Discharge Data

Table 2.10 and Map 2.1 show the rate of inpatient hospitalizations for asthma by county and whether the rates by county are statistically significantly different from the state rate.

Table 2.10
Inpatient hospital discharge rates for asthma, by county–
New Hampshire 2003& 2004

County	Number of Discharges	Age adjusted Rate/ 10,000	95% Confidence Intervals
Belknap	89	7.4	5.9-9.0
Carroll	61	6.8	5.2-8.8
Cheshire	73	4.9	3.7-6.0
Coos	76	10.8	8.3-13.3
Grafton	84	5.0	3.9-6.0
Hillsborough	750	9.4	8.8-10.1
Merrimack	223	7.6	6.6-8.6
Rockingham	295	5.2	4.6-5.8
Strafford	139	6.2	5.2-7.2
Sullivan	51	6.0	4.3-7.7
Total	1841	7.0	6.7-7.4

*Rates are per 10,000 residents and age-adjusted to 2000 US standard population. Only New Hampshire residents hospitalized in the state are included.

Population data used: Claritus 2003 & 2004 estimates

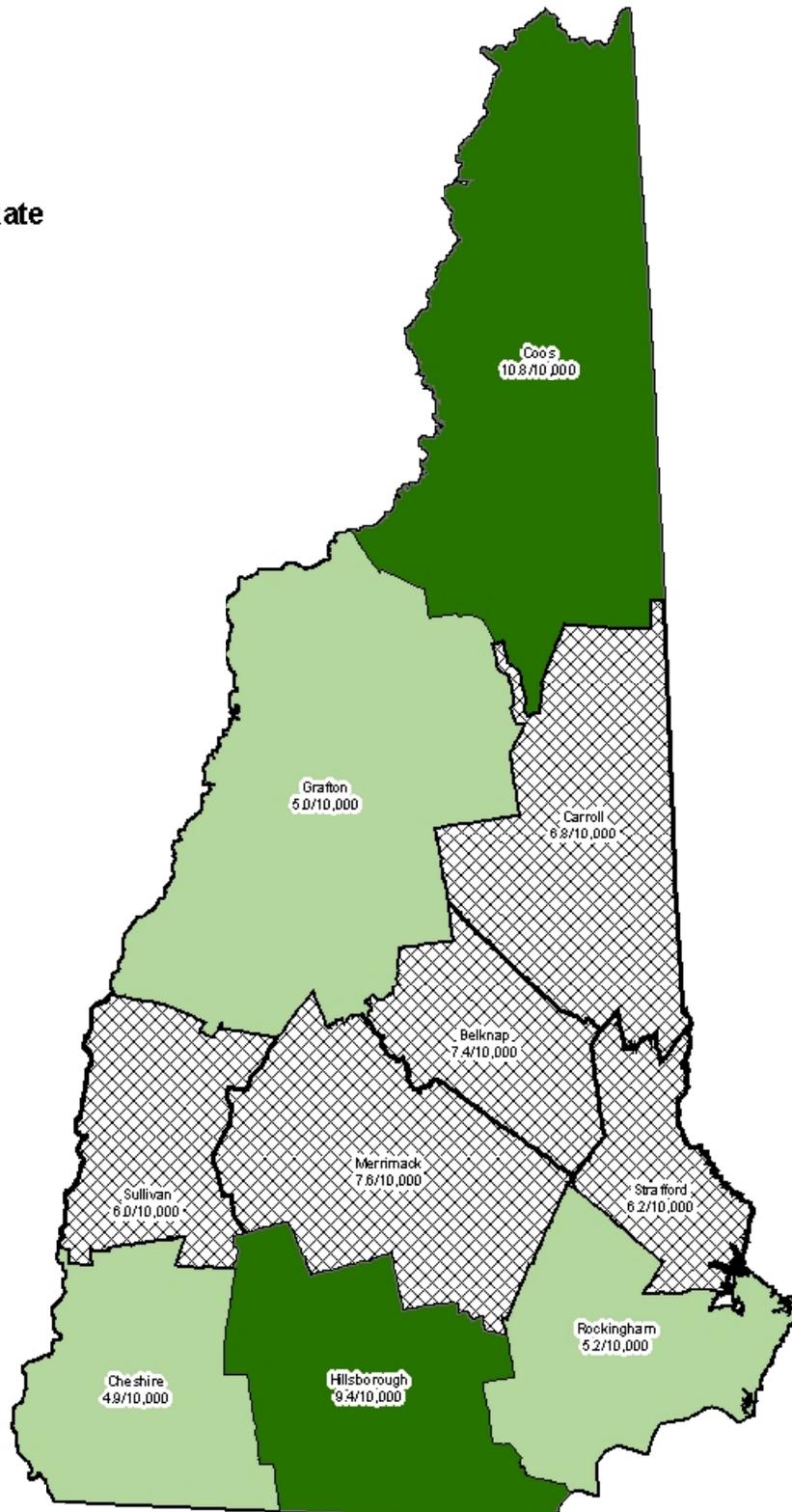
Source: New Hampshire Inpatient Hospital Discharge Data

Comment: It is important to note that the rate of inpatient hospitalizations with asthma listed as the primary diagnosis may be under-reported in New Hampshire’s southern counties. Some New Hampshire residents are hospitalized out-of-state and out-of-state hospitalizations are not recorded in the inpatient hospitalization discharge data set in a timely manner. Approximately 15% of inpatient hospitalizations occur out-of-state.

Map 2.1 Inpatient hospital discharge rates for asthma, by county and significance to state rate – New Hampshire 2003 & 2004

Significance to State Rate

- Statistically Higher
- Statistically Lower
- No Difference



Records from Inpatient datasets 2003-2004 with a Principal Diagnosis of Asthma

Age Standardization to US 2000 Standard Population.

All Rates per 10,000 residents. Significance determined by 95%CI.

Population data used: Claritus 2003&2004 estimates
Source: Health Statistics & Data Management Section

Map provided by DHHS/OMB/BDSM/jh 4/06
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3. EMERGENCY DEPARTMENT VISITS FOR ASTHMA

There were approximately 1.8 million emergency department visits for asthma in the United States in 2004, a rate of 62 per 10,000 people (National Hospital Ambulatory Medical Care Survey, 2004). In 1994, the most recent year for which national cost estimates are available, total charges for emergency department services for asthma were approximately 479 million dollars.⁸ Similar to inpatient hospitalization data, emergency department visit data can be used to examine the severity of asthma, both in terms of morbidity among individuals with asthma and overall burden to society. Management of asthma according to established guidelines can prevent most emergency department visits for the disease.

This section presents data on emergency department visits for asthma in New Hampshire from 1996 to 2004. It addresses questions such as: what are the annual number and rate of asthma emergency department visits, how have emergency department visit rates changed over time, and do emergency department visits vary by gender, age group, or season of the year? New Hampshire data are compared to national objectives for asthma emergency department visit rates to assess our progress toward meeting these goals. Data on charges associated with asthma emergency department visits are also included in order to provide a more complete picture of the burden of asthma in the state.

There is no confirmed asthma case classification for emergency department data. A probable case is defined as an emergency department record listing asthma as the primary discharge diagnosis.⁹ Discharge data represent the number of *visits* rather than the number of *persons* who sought care for asthma in the emergency department, and multiple visits by an individual are recorded as separate events. Prior to 2001, an asthma emergency department visit was defined as an *outpatient* hospital data set record of a New Hampshire resident listing asthma (ICD-9 CM code 493.0-493.9) as the principal discharge diagnosis. This case definition slightly overestimates the number of emergency department visits for asthma since the outpatient data set includes information on scheduled ambulatory surgeries as well as emergency department visits. A field designating patient-type (emergency department, ambulatory surgery, observation, or other) was added to the outpatient hospital discharge data set beginning in 1999 and incorporated into analyses starting in 2001. From 2001, only emergency department visits were included in the New Hampshire asthma report. In addition, New Hampshire residents who received care at an emergency department in another state are not included in the data set; therefore, the true asthma-related emergency department rate is probably higher.

METHODS

DEFINITIONS:

Principal diagnosis of asthma refers to discharges with a principal discharge diagnosis of asthma (ICD-9 CM code 493.0-493.9) and patient-type “emergency department”^{*}.

Underlying diagnosis of asthma refers to discharges with a secondary discharge diagnosis of asthma (ICD-9 CM code 493.0-493.9) and patient-type “emergency department”^{*}.

A discharge can have up to 8 secondary diagnoses. If a discharge has one or more secondary diagnoses of asthma, then it is classified as having an underlying diagnosis of asthma. Discharges that have both a primary and secondary diagnosis of asthma are classified only as having a primary diagnosis of asthma; they are not classified as having an underlying diagnosis of asthma.

Charges include both facility and physician charges when the physician is paid through the hospital; as a result charges do not capture all charges associated with all emergency department visits because some physicians are not paid through the hospital.

DATA SOURCES AND QUALITY OF DATA:

Outpatient Hospital Discharge Data

The *Outpatient Hospital Discharge Data* (OHDD) set contains discharge records for hospital emergency department visits, observation stays in the emergency department after illness or injury, and hospital visits for scheduled ambulatory surgeries. OHDD is used when comparing asthma emergency department visits to Healthy 2010 objectives and national rates by age and gender. The same process is used for collecting OHDD as IHDD. For more details see *Section 2 Inpatient Hospitalization for Asthma*.

Like IHDD, OHDD records are fairly complete and of high quality, though race is not recorded in this data set and approximately 0.02% of the primary diagnosis codes are missing. In addition, many people in the southern part of the state go to Massachusetts for urgent care, and due to the time lag in getting data from other states, only emergency department visits that occur within New Hampshire are reported. This may lead to an artificially lower rate of emergency department visits due to asthma in some areas.

In 1999, a new field was added to distinguish emergency department visits, observation stays, and ambulatory surgeries. This new field was not incorporated into these analyses until 2001, at which time only emergency department visits were included. Because of this change, rates prior to 2001 cannot be directly compared to those after 2001. Nor can they be compared to national

^{*} Prior to 2001, patient-type was not included in the outpatient hospital discharge data. Data prior to 2001 include scheduled ambulatory surgeries, observations, and other outpatient services provided by the hospital. Due to the change in definitions in 2001, emergency department visits prior to 2001 cannot be directly compared to visits that occurred after 2001.

rates, which only take into account emergency department visits. It is estimated that rates prior to 2001 are overestimated by 1 to 5%.

This report contains data on asthma outpatient hospital visits from 1996-2000 and emergency department visits from 2001-2004. Additional information about New Hampshire outpatient hospital discharge data is available on-line at:

<http://www.dhhs.nh.gov/DHHS/HSDM/hospital-discharge-data.htm>

National Hospital Ambulatory Medical Care Survey

The *National Hospital Ambulatory Medical Care Survey* (NHAMCS) collects data on the utilization and provision of ambulatory care services in hospital emergency and outpatient departments. This survey is based on a national sample of approximately 36,500 visits to emergency departments and 31,000 outpatient department visits from a national sample of hospitals. In order to determine the national rate of emergency department visits due to asthma, only emergency department visits were included in analyses.

Healthy People 2010

Healthy People 2010 is a set of national health targets to be reached by 2010. It builds on initiatives pursued over the past two decades including the *1979 Surgeon General's Report*, *Healthy People*, and *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*. It is designed to achieve two overarching goals: 1) increase quality and years of healthy life, and 2) eliminate health disparities. Eight objectives address asthma (see *Appendix B*). A copy of *Healthy People 2010* can be obtained on-line at:

<http://www.health.gov/healthypeople/>.

ANALYSIS:

SAS and SAS-Callable SUDAAN 9.0 were used to conduct analyses using Outpatient Hospital Discharge Data and data from the National Hospital Ambulatory Medical Care Survey.

National Comparisons

The *National Hospital Ambulatory Medical Care Survey* is used to obtain the rates of emergency department visits for asthma nationally and the analysis is stratified by race. New Hampshire rates are compared to rates for the US white population rather than to overall US rates due to the relatively small minority population in the state compared to the US. Minorities represent 4% of New Hampshire's population, whereas nationally minorities represent 25% of the population. Where appropriate, asthma-related objectives from *Healthy People 2010* are presented to put current asthma data from New Hampshire in perspective.

Age-Adjusted Rates

In some tables, both crude rates and age-adjusted rates are presented. The crude rate is calculated by dividing the number of events by the state's population. Because the events of interest (e.g., hospitalizations and deaths) are more common as a person ages, the crude rate can be affected by the age structure of a population. To control for the effect of age, rates are adjusted using the direct method and the 2000 United States standard population. The age-adjusted rate allows for more meaningful analysis when comparing data between states or when looking at trends in a single state over time. Appendix C gives the formulas used to calculate age-adjusted rates.

Numerators for Rate Calculations

Numerators for rate calculations include New Hampshire residents only; residents of other states who visited an emergency department in New Hampshire are excluded. New Hampshire emergency department discharge data do not include out-of-state emergency department visits of New Hampshire residents. Prior to 2001, outpatient hospital discharge data included not only emergency department visits but other outpatient visits such as ambulatory surgery, observation, and other outpatient visits. In 2001, steps were taken to account for this. Numerator calculations for emergency room visits after 2001 include only emergency room visits.

Denominators for Rate Calculations

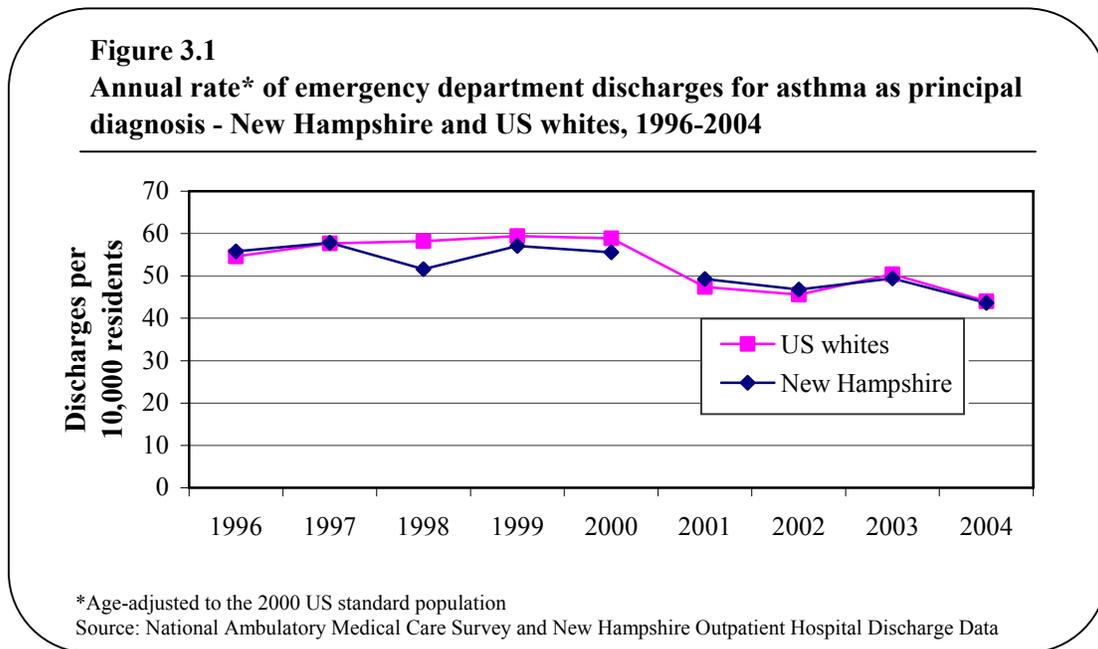
Intercensal population were obtained from the US Census (Table ST-99-8: Population Estimates for the US, Regions, Divisions, and States by 5 year Age Groups and Sex: Time Series Estimates, July 1, 1990 to July 1, 1999 and April 1, 1990 Census Population Counts)¹⁰ However for Table 3.2 and 3.3, population estimates were extrapolated by taking the difference between the 1990 and 2000 population estimates, dividing it by ten to obtain a yearly increment, and adding multiples of this amount to the 1990 population to obtain estimates for 1991-1999. This was done because more accurate US Census data stratified by sex and age were difficult to find when these data were originally analyzed. To be consistent with the previous reports, rates were not recalculated.

Population estimates for 2000-2004 were obtained from the US Census Bureau. (Table 2: Annual Estimates of the Population by Sex and Age for New Hampshire: April 1, 2000 to July 1, 2004 (SC-EST2004-02-33))¹¹

Confidence Intervals

Although these data are not from a survey and in theory all emergency room discharges in the state have been captured, the confidence intervals still serve a purpose. The confidence intervals help to determine if the different rates seen from year to year are due to expected fluctuations based on the number of discharges and the size of the population or if they are different from one year to the next. Appendix C gives the formulas used to calculate 95% confidence intervals.

Figure 3.1 compares the annual rate of emergency department discharges for asthma in New Hampshire to the national rate among whites.



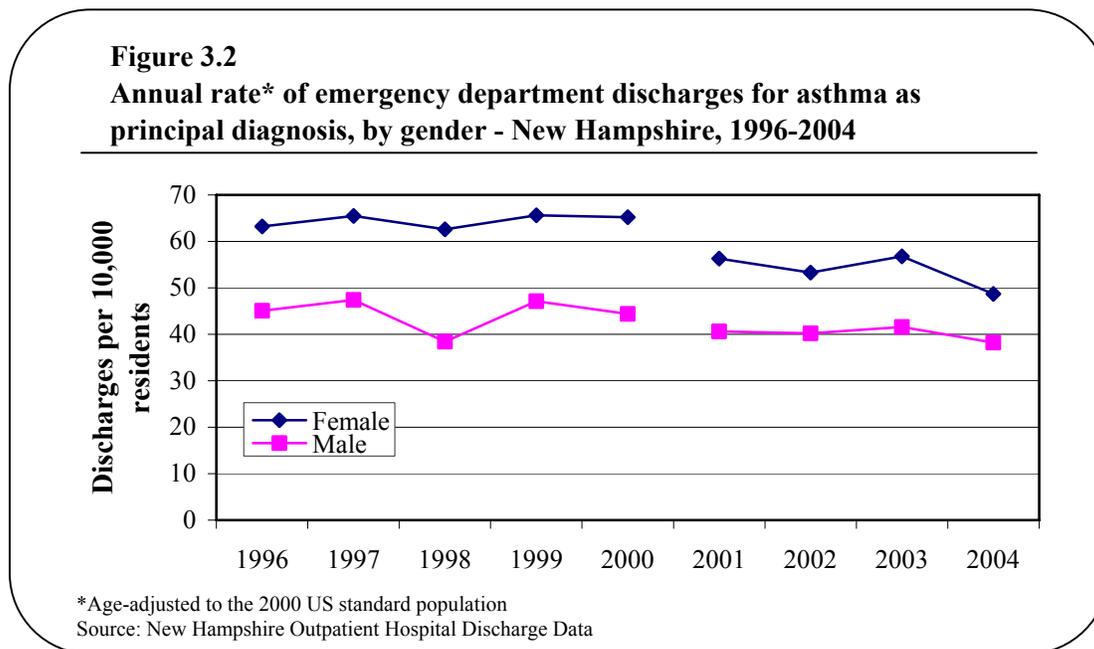
Comment: The age-adjusted rate of emergency department visits for asthma among New Hampshire residents was 43.6 per 10,000 residents in 2004. New Hampshire rates were about equivalent to the rates for US whites from 2001 to 2004.

Table 3.1
Annual number and rate* of emergency department discharges for asthma as principal diagnosis - New Hampshire, 1996-2004

	Number	Crude Rate	Age-Adjusted**Rate	95% CI
1996	6485	55.9	55.8	54.4-57.2
1997	6795	57.9	57.8	56.4-59.2
1998	6136	51.8	51.6	50.3-52.9
1999	6853	57.1	57.1	55.8-58.5
2000	6793	55.0	55.6	54.3-56.9
2001	6096	48.6	49.3	48.1-50.6
2002	5875	46.1	46.8	45.6-48.0
2003	6180	48.0	49.4	48.1-50.6
2004	5498	42.3	43.6	42.4-44.7

*Rates are per 10,000 residents. Only New Hampshire residents visiting an emergency department in the state are included. **Age-adjusted to the 2000 US standard population.
 Source: New Hampshire Outpatient Hospital Discharge Data

Figure 3.2 compares the annual rate of emergency department visits for asthma in New Hampshire by gender.



Comment: Females have a higher rate of emergency department visits for asthma than males, both in New Hampshire and nationally. This gender difference is also seen in data on inpatient hospitalization and death from asthma. In 2004, the rate of asthma emergency department visits for New Hampshire females was 48.7 per 10,000 residents versus 38.2 per 10,000 residents for New Hampshire males. The difference between male and female rates has been consistent over time, with female rates about 30% higher than male rates each year from 1996-2004.

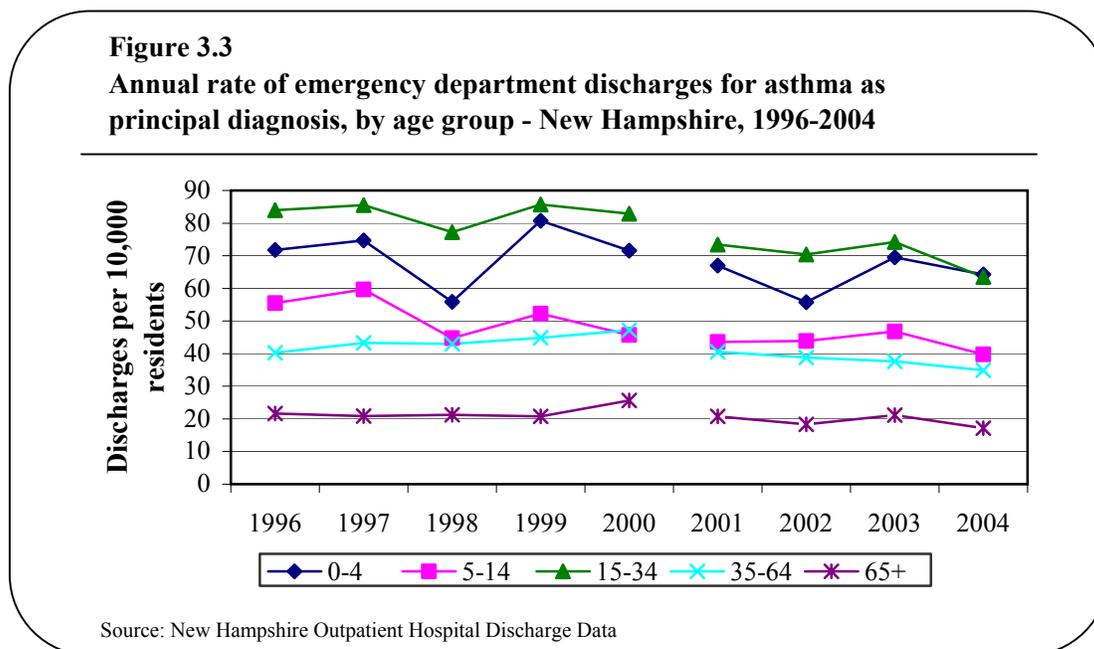
Table 3.2
Annual number and rate* of emergency department discharges for asthma as principal diagnosis, by gender - New Hampshire, 1996-2004

	Male			Female			Total		
	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI
1996	2671	45.1	43.4-46.8	3814	63.2	61.2-65.2	6485	55.8	54.4-57.2
1997	2819	47.4	45.6-49.2	3976	65.5	63.5-67.5	6795	57.8	56.4-59.2
1998	2301	38.4	36.8-40.1	3835	62.6	60.6-64.6	6136	51.6	50.3-52.9
1999	2833	47.1	45.4-48.8	4020	65.6	63.6-67.6	6853	57.1	55.8-58.5
2000	2699	44.4	42.7-46.1	4094	65.2	64.2-66.2	6793	55.6	54.3-56.9
2001	2504	40.6	39.0-42.2	3592	56.3	54.4-58.2	6096	49.3	48.1-50.6
2002	2482	40.2	38.6-41.8	3393	53.3	51.5-55.1	5875	46.8	45.6-48.0
2003	2548	41.6	40.0-43.3	3632	56.8	54.9-58.7	6180	49.4	48.1-50.6
2004	2372	38.2	36.7-39.8	3126	48.7	46.9-50.4	5498	43.6	42.4-44.7

*Rates are per 10,000 residents and age-adjusted to the 2000 US standard population. Only New Hampshire residents visiting an emergency department in the state are included.

Source: New Hampshire Outpatient Hospital Discharge Data

Figure 3.3 compares the annual rate of asthma hospitalizations in New Hampshire by age group.



Comment: New Hampshire residents aged 0 to 4 and 15 to 34 years of age had the highest rates of emergency department visits for asthma in 2004, 64.3 per 10,000 residents and 63.5 per 10,000 residents respectively. Nationally, children aged 0 to 4 have the highest rates of emergency department visits for asthma (National Hospital Ambulatory Medical Care Survey, 2004).

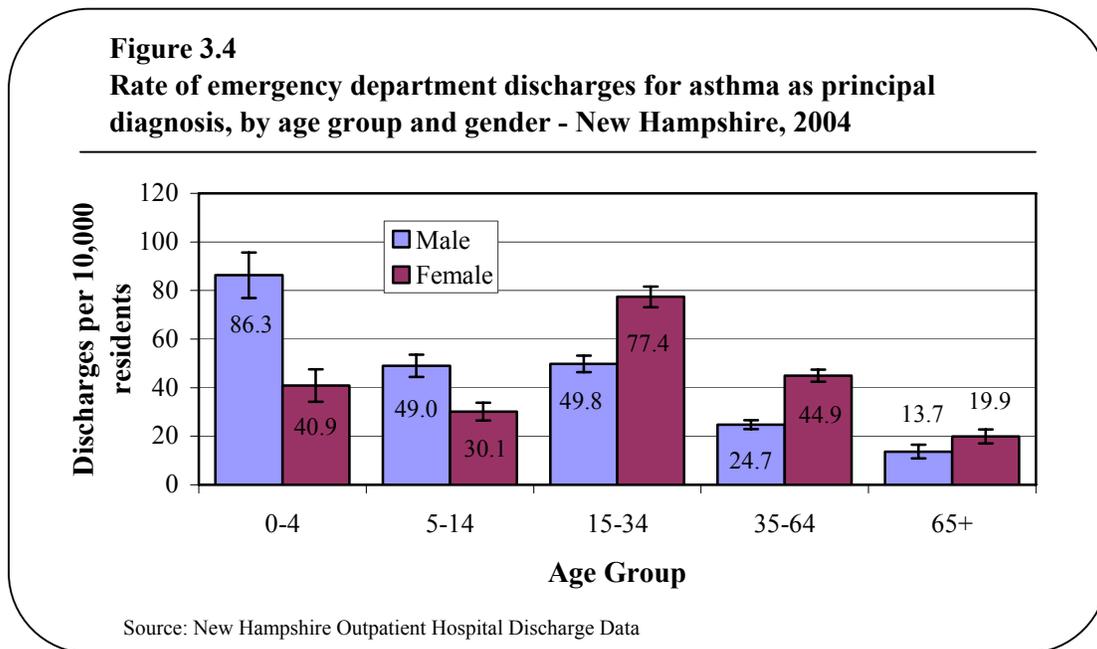
Table 3.3
Annual number and rate* of emergency department discharges for asthma as principal diagnosis, by age group – New Hampshire, 1996-2004

	0-4			5-14			15-34			35-64			65+			Total		
	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI	N	Rate	95% CI
1996	569	71.8	65.5-78.1	943	55.5	52.0-59.0	2812	84.0	80.9-87.1	1862	40.3	38.4-42.2	299	21.6	19.2-24.0	6485	55.8	54.4-57.2
1997	585	74.7	68.2-81.2	1032	59.7	56.1-63.3	2824	85.5	82.3-88.7	2059	43.3	41.3-45.3	295	20.9	18.5-23.3	6795	57.8	56.4-59.2
1998	433	55.9	50.3-61.5	788	44.8	41.7-47.9	2511	77.2	74.2-80.2	2099	43.0	41.1-44.9	305	21.3	18.9-23.7	6136	51.6	50.3-52.9
1999	618	80.7	74.1-87.3	935	52.3	48.9-55.7	2745	85.7	82.6-88.8	2252	44.9	42.9-46.9	303	20.8	18.4-23.2	6853	57.1	55.8-58.5
2000	542	71.6	65.5-77.7	830	45.7	42.6-48.8	2616	82.9	79.7-86.1	2427	47.2	45.3-49.1	378	25.6	23.0-28.2	6793	55.6	54.3-56.9
2001	511	67	61.0-73.0	802	43.6	40.5-46.7	2337	73.4	70.4-76.4	2135	40.6	38.9-42.3	311	20.8	18.5-23.1	6096	49.3	48.1-50.6
2002	408	55.8	50.4-61.2	783	43.9	40.8-47.0	2275	70.4	71.2-77.2	2130	38.8	37.2-40.4	279	18.3	16.1-20.5	5875	46.8	45.6-48.0
2003	505	69.5	63.4-75.6	827	46.8	43.6-50.0	2420	74.2	71.2-77.2	2100	37.6	36.0-39.2	328	21.2	18.9-23.5	6180	49.4	48.1-50.6
2004	467	64.3	58.5-70.1	695	39.8	36.8-42.8	2089	63.5	60.8-66.2	1977	34.9	33.4-36.4	270	17.2	15.1-19.3	5498	43.6	42.4-44.7

*Rates are per 10,000 residents. Only New Hampshire residents visiting an emergency department in the state are included. **Rates for the total are age-adjusted to the 2000 US standard population.

Source: New Hampshire Outpatient Hospital Discharge Data

Figure 3.4 compares the rate of emergency department discharges for asthma in New Hampshire by age group and gender.



Comment: The rate of emergency department visits for asthma in New Hampshire varied considerably by both age and gender. From age 0 to 14, New Hampshire males had higher rates of asthma emergency department visits than New Hampshire females. After age 14, females had higher rates. This age-gender difference is also seen in data on inpatient hospitalizations for asthma. In 2004, the emergency department visit rate for females peaked at age 15 to 34 and then declined with age. Among males, children 0 to 4 years of age had the highest rate of emergency department visits for asthma.

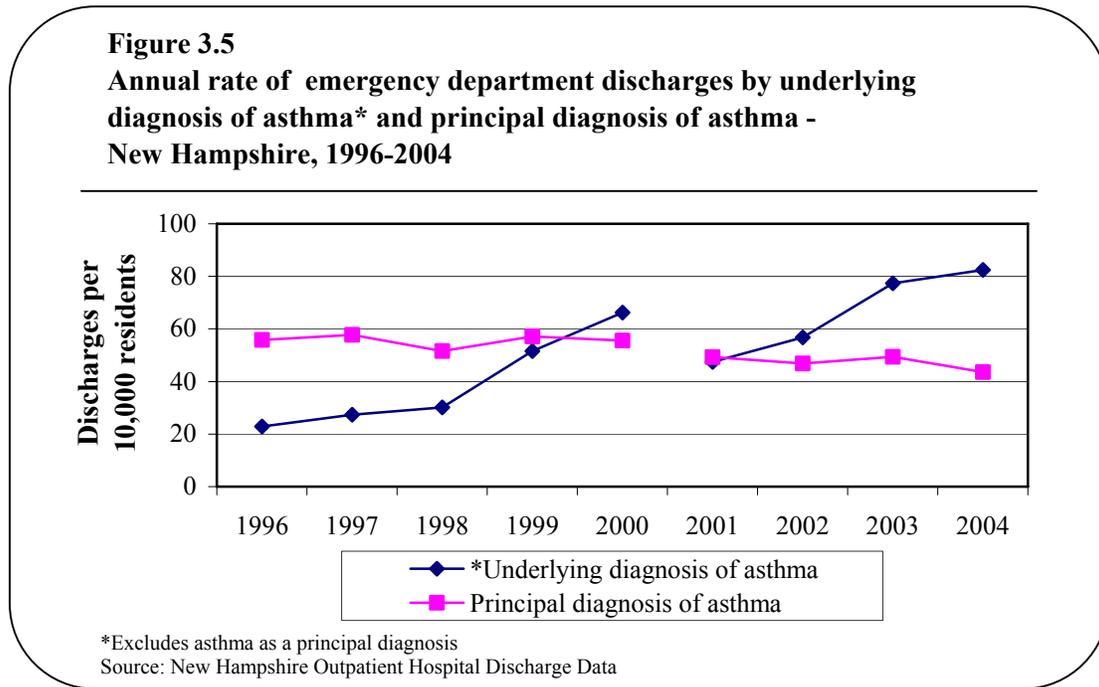
Table 3.4
Number and rate* of emergency department discharges for asthma as principal diagnosis, by age group and gender - New Hampshire, 2004

Gender		0-4	5-14	15-34	35-64	65+
Male	N	323	439	824	694	92
	Rate	86.3	49	49.8	24.7	13.7
	95% CI	76.9-95.7	44.4-53.6	46.4-53.2	22.9-26.5	11.0-16.8
Female	N	144	256	1265	1283	178
	Rate	40.9	30.1	77.4	44.9	19.9
	95% CI	34.2-47.6	26.4-33.8	73.1-81.7	42.4-47.7	17.0-22.8

*Rates are per 10,000 residents. Only New Hampshire residents visiting an emergency department in the state are included.

Source: New Hampshire Outpatient Hospital Discharge Data

Figure 3.5 compares the annual rate of emergency department discharges for asthma in New Hampshire by underlying and principal diagnosis.



Comment: In New Hampshire, the underlying diagnosis of asthma has almost doubled since 2001. Note that a person with a principal diagnosis of a broken arm could have an underlying diagnosis of asthma.

Further studies are needed to determine what the rise in underlying diagnosis is due to: a change in billing and coding practices, increased awareness of asthma, increased prevalence of asthma, or other factors.

Table 3.5
Annual number and rate* of emergency department discharges, by underlying diagnosis of asthma and principal diagnosis of asthma - New Hampshire, 1996-2004**

	**Underlying diagnosis of asthma			Principal diagnosis of asthma		
	N	Rate	95% CI	N	Rate	95% CI
1996	2631	22.9	22.0-23.8	6485	55.8	54.4-57.2
1997	3178	27.4	26.4-28.3	6795	57.8	56.4-59.2
1998	3554	30.2	29.2-31.2	6136	51.6	50.3-52.9
1999	6150	51.6	50.3-52.9	6853	57.1	55.8-58.5
2000	8124	66.2	64.7-67.6	6793	55.6	54.3-56.9
2001	5874	47.5	46.2-48.7	6096	49.3	48.1-50.6
2002	7108	56.8	55.4-58.1	5875	46.8	45.6-48.0
2003	9749	77.4	75.9-79.0	6180	49.4	48.1-50.6
2004	10437	82.4	80.8-84.0	5498	43.6	42.4-44.7

*Rates are per 10,000 residents and age-adjusted to the 2000 US standard population. Only New Hampshire residents visiting an emergency department in the state are included. ** Excludes asthma as a principal diagnosis.
 Source: New Hampshire Outpatient Hospital Discharge Data

Table 3.6 compares New Hampshire emergency department rates for 2001 and 2004 with national 2010 objectives by age group.

Table 3.6
Comparison of New Hampshire emergency department rates*
and 2010 objectives, by age group

Age Group	2001 NH Rate	2004 NH Rate	2010 Target US Healthy People
0 to 4	67.0	64.3	80
5 to 64	51.3	44.5	50
≥65	20.8	17.2	15

*Rates are per 10,000 residents.

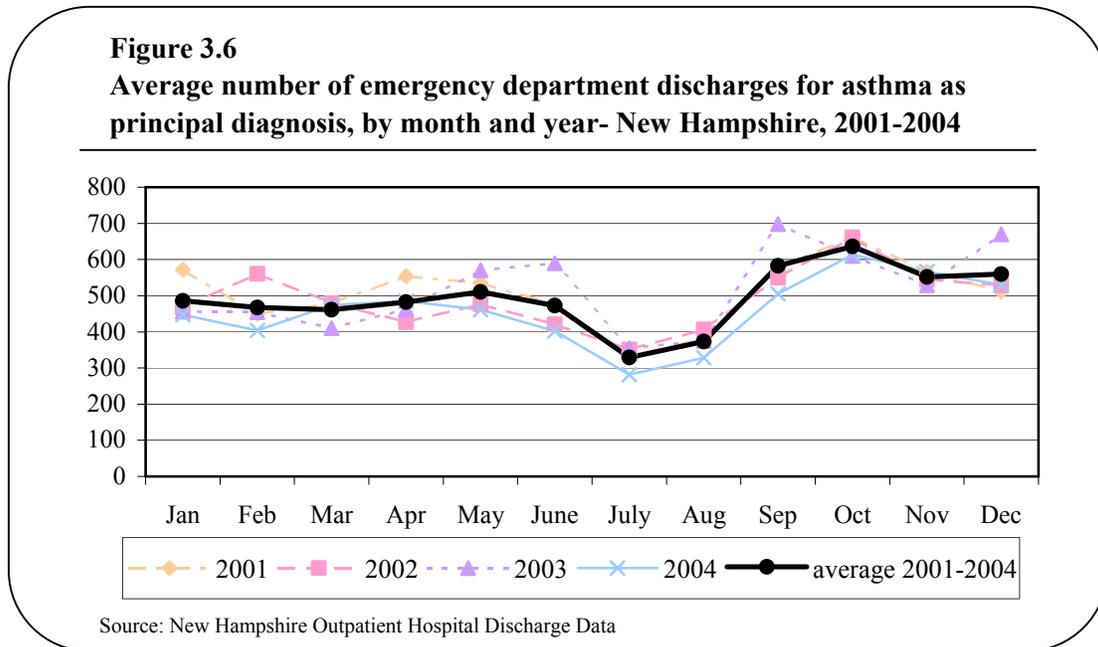
Source: New Hampshire Outpatient Hospital Discharge Data

Comment: Emergency department visits for asthma are the basis of a national objective for asthma in *Healthy People 2010*. Objective 24-3 uses emergency department visits with a primary discharge diagnosis of asthma (ICD-9_CM code 493.0-493.9) for the numerator and resident population from the US Census for the denominator. This objective calls for a reduction of emergency department visits for asthma to 80 per 10,000 in children under age 5, 50 per 10,000 in persons aged 5 to 64 years, and 15 per 10,000 in persons aged 65 and older.¹

For each age group in New Hampshire, the rate of emergency department visits for asthma has declined since 2001. The 0 to 4 and 5 to 64 age groups are currently below the 2010 target, but the 65 and older age group is higher than the 2010 target.

A complete list of asthma-related *Healthy People 2010* objectives can be found in Appendix B.

Figure 3.6 shows the average number of emergency department discharges for asthma in New Hampshire by month and year.



Comment: The number of emergency department visits for asthma in New Hampshire tends to vary over the course of the year, with peaks during the spring and fall seasons and a decline in the summer. The largest number of emergency department visits for asthma tends to occur in the fall, between September and December, with a rapid increase from August to September and the highest number in October. The lowest number of emergency department visits for asthma occurs in July and August. A similar seasonal pattern is seen in data on inpatient hospitalizations for asthma.

Further studies are needed to determine what seasonal variations in inpatient and emergency department visits are due to: seasonal allergies; increased exposure to indoor air triggers such as dust, mold, and environmental tobacco smoke; greater likelihood of upper respiratory infections that may exacerbate asthma; or other factors.

Table 3.7 shows charges for emergency department visits in New Hampshire from 1996-2004.

Table 3.7
Charges for asthma emergency department discharges -
New Hampshire, 1996-2004

	Charges (dollars*)			
	N	Mean	Median	Total
1996	6485	416	306	2,695,971
1997	6795	410	301	2,783,508
1998	6136	452	325	2,770,292
1999	6853	464	342	3,176,176
2000	6793	487	358	3,306,318
2001	6096	473	398	2,880,873
2002	5875	540	451	3,171,250
2003	6180	622	514	3,843,471
2004	5498	714	581	3,925,746

*Unadjusted dollars.

Source: New Hampshire Outpatient Hospital Discharge Data

Comment: There were 5,498 emergency department visits for asthma in New Hampshire in 2004, resulting in approximately 3.9 million dollars in charges. The median charge for an asthma emergency department visit was \$581 in 2004. Since 2001, the total charges for emergency department visits for asthma in New Hampshire have increased by 36% or approximately a million dollars despite the number and rate of visits declining over the same period.

Table 3.8 shows charges for asthma emergency department visits in New Hampshire in 2004, by age group.

Table 3.8
Charges for asthma emergency department discharges, by age group – New Hampshire, 2004

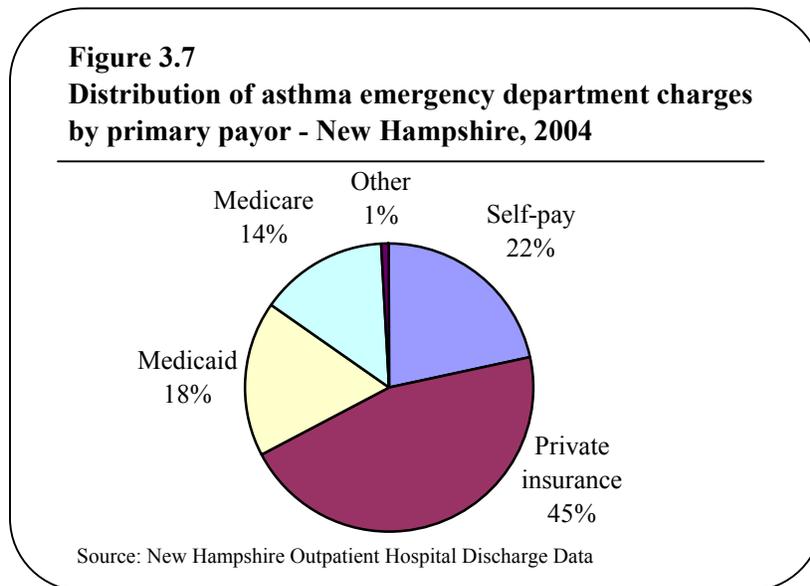
Charges (dollars*)				
Age Group	N	Mean	Median	Total
0-4	467	609	542	284,474
5-14	695	569	489	395,255
15-34	2089	629	527	1,315,009
35-64	1977	819	654	1,619,395
65+	270	1154	969	311,613
Total	5498	714	581	3,925,746

*Unadjusted dollars.

Source: New Hampshire Outpatient Hospital Discharge Data

Comment: As age increases so do the mean and median charges for asthma emergency department visits in New Hampshire.

Figure 3.7 shows the distribution of emergency department charges for asthma in New Hampshire in 2004, by primary payor.



Comment: In New Hampshire, private insurance (e.g., HMO or Blue Cross) was the primary source of payment for 45.6% of all emergency department charges in 2004. Medicaid and Medicare each accounted for 17.5% and 14.3% of emergency department visit charges, respectively. Approximately 21.5% of charges were classified as self-pay. The self-pay category likely represents the underinsured or uninsured population in New Hampshire; these individuals generally lack regular access to primary care or pharmacological services and tend to use emergency departments as their main or sole source of medical care for asthma.

Charges for emergency department visits include both facility and physician charges only when the physician is paid through the hospital; this results in an under reporting of the total charges submitted to payors for an emergency department visit.

Table 3.9
Asthma emergency department discharges charges, by primary payor – New Hampshire, 2004

Payor	Number of emergency department visits	Charges (dollars*)	Percent of total charges
Self-pay	1240	843,628	21.5
Private insurance	2571	1,788,983	45.6
Medicaid	1076	687,281	17.5
Medicare	543	561,809	14.3
Other	68	44,045	1.1
Total	5498	3,925,746	100.0

*Unadjusted dollars

Source: New Hampshire Outpatient Hospital Discharge Data

Table 3.10 and Map 3.1 show the rate of emergency department visits for asthma by county and whether the rates by county are statistically significantly different from the state rate.

Table 3.10
Emergency department discharge rates for asthma, by county –
New Hampshire 2003 & 2004

County	Number of Emergency Department visits	Age adjusted Rate/ 10,000	95% Confidence Intervals
Belknap	742	66.9	62.0-71.7
Carroll	461	61.3	55.6-67.0
Cheshire	470	32.1	29.2-35.1
Coos	422	71.9	64.9-78.9
Grafton	833	51.4	47.9-55.0
Hillsborough	3693	46.4	44.9-47.9
Merrimack	1158	41.8	39.4-44.2
Rockingham	2037	35.6	34.1-37.2
Strafford	1312	55.3	52.3-58.3
Sullivan	550	72.4	66.3-78.5
Total	11678	48.6	47.3-50.0

*Rates are per 10,000 residents and age-adjusted to 2000 US standard population. Only New Hampshire residents hospitalized in the state are included.
 Population data used: Claritus 2003 & 2004 estimates
 Source: New Hampshire Outpatient Hospital Discharge Data

Comment: It is important to note that the rate of emergency department visits with asthma listed as the primary diagnosis may be under-reported in New Hampshire's southern counties. Some New Hampshire residents visit out-of-state emergency departments and out-of-state emergency department visits are not reported in the outpatient hospital discharge data set in a timely manner. Approximately 3% of emergency department visits occur out of state.

Map 3.1 Emergency department discharge rates for asthma, by county and significance to state rate – New Hampshire 2003 & 2004

Significance to State Rate

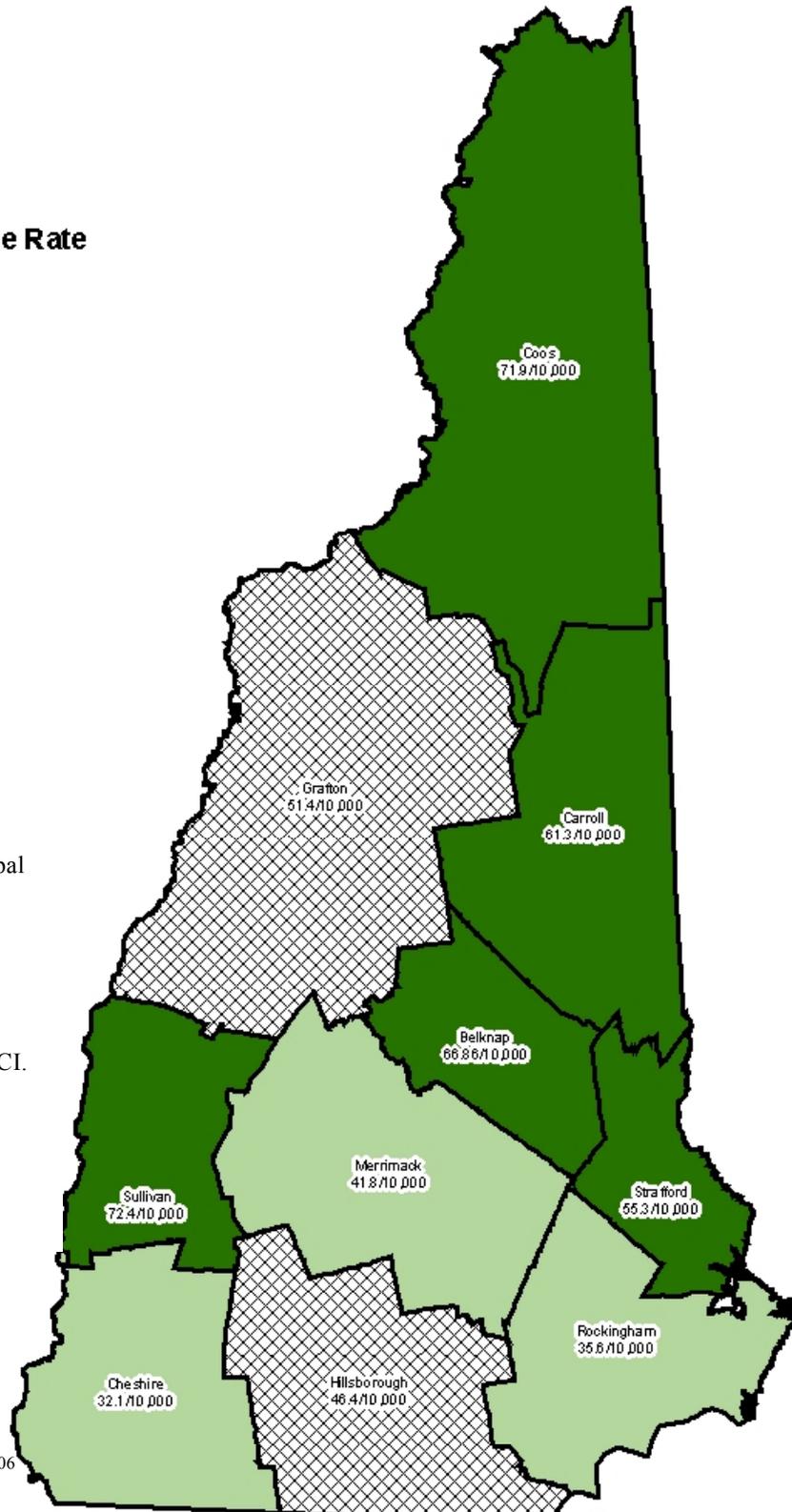
- Statistically Higher
- Statistically Lower
- No Difference

Records from Emergency Dept. datasets 2003-2004 with a Principal Diagnosis of Asthma

Age Standardization to US 2000 Standard Population.

All Rates per 10,000 residents
Significance determined by 95% CI.

Population data used:
Claritus 2003 & 2004 estimates
Source: Health Statistics & Data Management Section



Map provided by DHHS/OMB/BDSM/jh 4/06
C:\2006\Mapping\Asthma\Reg 3510\EDAllByCounty.mxd

4. MORTALITY DUE TO ASTHMA

This section presents information on the number and rate of deaths due to asthma among New Hampshire residents from 1990 to 2002. Annual death counts for males and females are also included. It was not possible to determine whether asthma mortality rates in New Hampshire varied by gender, age, or geographic location due to the small number of deaths in each population subgroup during this time period.

METHODS

DEFINITIONS:

For this report, an *asthma death* is defined as a New Hampshire resident death record listing asthma as the underlying cause of death. Death data were coded under the Ninth Revision of the International Classification of Diseases (ICD-9) from 1990-1998; a diagnosis code of 493.0-493.9 was used to identify asthma deaths during these years. ICD Revision 10 was implemented in 1999; therefore, the ICD-10 asthma diagnosis codes J-45 and J-46 were used to identify asthma deaths that occurred from 1999-2002. A comparability ratio was used to adjust for the change in coding.

DATA SOURCES AND QUALITY OF DATA:

CDC WONDER: Compressed Mortality database

CDC WONDER (Wide-ranging OnLine Data for Epidemiologic Research) is an easy-to-use internet system that makes the information resources of the Centers for Disease Control and Prevention (CDC) available to public health professionals and the public at large.¹⁵ It provides access to a wide array of public health information including mortality data.

CDC WONDER houses mortality data in the Compressed Mortality database, which contains mortality and population counts for all US counties for the years 1979 to 2002. Counts and rates of death can be obtained by cause of death, state, county, age, race, gender, and year. The number of deaths, crude death rates, or age-adjusted death rates can be obtained by place of residence (total US, state, and county), age group, race (white, black, and other), gender, year of death, and underlying cause-of-death (4-digit ICD code or group of codes).

Mortality datasets are one of the most complete datasets because all fields must be complete prior to submitting a death certificate. However, mortality data are subject to errors on several levels and data quality issues may result in an underestimation of deaths due to asthma.^{16,17,18} A variety of people with differing levels of experience are typically involved in completing a death certificate; medical residents are often assigned to fill out death certificates, and their inexperience increases the likelihood of error.¹⁶ In addition, many factors may result in death and sifting through these is a challenge. One study showed that 41% of cause of death statements had errors.¹⁹

Due to a change in the coding system from ICD-9 to ICD-10 codes in 1999, mortality data prior to 1999 cannot be directly compared to data after 1999. In order to account for the effect of implementing ICD-10 codes, comparability ratios for selected causes of death were calculated by the National Center for Health Statistics, National Vital Statistics System. The comparability ratio for asthma is 0.8938. This means that changes in the selection and grouping of underlying causes of death under ICD-10 reduced the possibility of asthma being coded as the underlying cause of death by 11%.

This report contains data on asthma deaths from 1990-2002. Additional information about New Hampshire mortality data is available on-line at:

<http://www.dhhs.nh.gov/DHHS/HSDM/death-data.htm> or

<http://wonder.cdc.gov/mortSQL.html>.

ANALYSIS:

Queries were run using CDC WONDER: Compressed Mortality File to obtain counts and rates.

Age-Adjustment Rates

In Table 4.2, the age-adjusted rate is presented because the events of interest (death) are more common as a person ages. To control for the effect of age, rates were adjusted using the direct method and the 2000 United States standard population. The age-adjusted rate allows for more meaningful analysis when comparing data between states or when looking at trends in a single state over time.

Numerators for Rate Calculations

Numerators for rate calculations included only New Hampshire residents; however, unlike the hospitalization data, the numerator also includes deaths of New Hampshire residents that occurred out-of-state. When rates were calculated using data prior to 1999, the numerator was adjusted using the comparability ratio for asthma (0.8938).

Comparability ratios may be applied to the number and rate of deaths that occurred prior to 1999 in order to adjust for the introduction of ICD-10. In this report, the comparability ratio has been applied to New Hampshire asthma mortality rate data from 1990-1998. Asthma death count data were not adjusted in order to present the actual number of deaths per year.

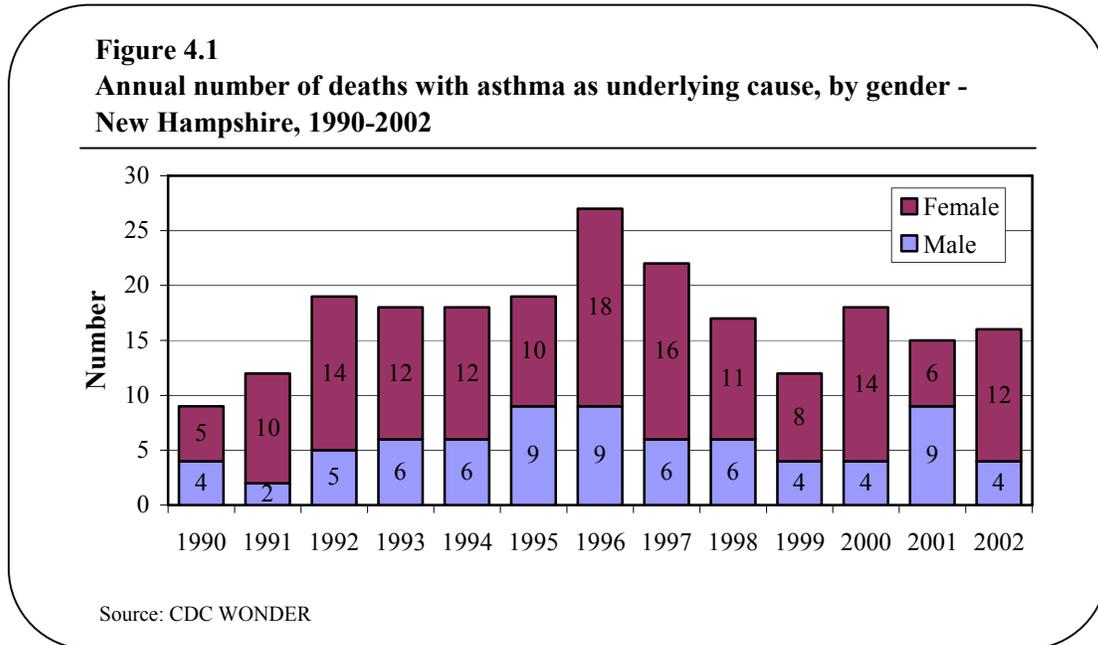
Denominators for Rate Calculations

Population estimates were provided by CDC WONDER: Compressed Mortality File, based on projections from the 1990 and 2000 US Census.

Confidence Intervals

Although these data are not from a survey and in theory all deaths among New Hampshire residents have been captured, the confidence intervals still serve a purpose. The confidence intervals help to determine if the different rates seen from year to year are due to expected fluctuations based on the number of deaths and the size of the population or if they are different from one year to the next. Appendix C gives the formulas used to calculate 95% confidence intervals.

Figure 4.1 shows the annual number of deaths in New Hampshire with asthma as the underlying cause, by gender.



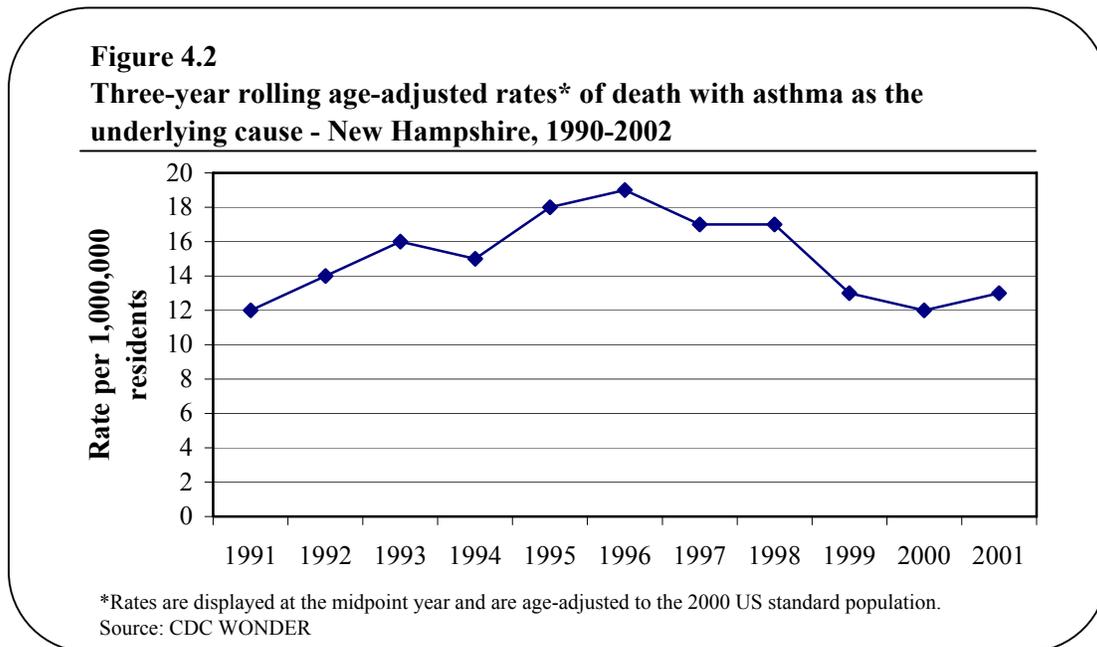
Comment: There were a total of 222 deaths of New Hampshire residents due to asthma over the period 1990-2002. Approximately two-thirds (148) of all deaths were among female residents. Nationally, the number of asthma deaths among females is about one and a half times the number in males.² In 2002, there were 16 deaths due to asthma. The comparability ratio for asthma was not applied to New Hampshire data on annual death counts in order to present the actual number of deaths that occurred each year. As a result, any change in the number of deaths due to asthma should be interpreted with caution. In addition, it is inappropriate to look for trends using this graph because the number of deaths is plotted and not the rate of deaths, which takes into account changes in population.

4.Table 4.1
Annual number of deaths with asthma as underlying
cause of death, by gender – New Hampshire, 1990-2002*

	Male	Female	Total
1990	4	5	9
1991	2	10	12
1992	5	14	19
1993	6	12	18
1994	6	12	18
1995	9	10	19
1996	9	18	27
1997	6	16	22
1998	6	11	17
1999	4	8	12
2000	4	14	18
2001	9	6	15
2002	4	12	16

*Cause of death coding converted from ICD-9 to ICD-10 in 1999.
 Source: CDC WONDER

Figure 4.2 shows annual age-adjusted rates of death in New Hampshire with asthma as the underlying cause.



Comment: Due to the relatively small number of asthma deaths per year, reliable annual mortality rates for each year from 1990 to 2002 could not be calculated. Therefore, years of data were combined and New Hampshire rates were calculated as three-year rolling averages. These rates were calculated using the number of deaths and the total population for each year included in the three-year span. New Hampshire rolling average rates for 1990-2002 are displayed at the midpoint year.

Table 4.2
Three-year age-adjusted rates* of death with asthma as underlying cause - New Hampshire, 1990-2002

	Number	Rate	95% CI
1990-1992	40	12	8.6-16.3
1991-1993	49	14	10.4-18.5
1992-1994	55	16	12.1-20.8
1993-1995	55	15	11.3-19.5
1994-1996	64	18	13.9-23.0
1995-1997	68	19	14.8-24.1
1996-1998	66	17	13.1-21.6
1997-1999	61	17	13.0-21.8
1998-2000	47	13	9.6-17.3
1999-2001	45	12	8.8-16.1
2000-2002	49	13	9.6-17.2

*Rates per 1,000,000. Comparability ratio applied to account for coding conversion from ICD-9 to ICD-10 in 1999.
 Source: CDC WONDER

Table 4.3 compares New Hampshire asthma mortality rates and the *Healthy People 2010* objective for asthma mortality, by age group.

Table 4.3
Comparison of New Hampshire asthma mortality rates and the Healthy People 2010 objective, by age group

Age Group	1996-2000		1997-2001		1998-2002		2010 Objective
	N	Rate*	N	Rate*	N	Rate*	
0-4	0	-	0	-	0	-	1.0
5-14	1	-	0	-	0	-	1.0
15-34	4	-	4	-	7	-	3.0
35-64	33	12.5	28	10.6	23	8.7	9.0
65+	58	74.0	52	67.1	48	62.9	60.0

*Rates are per 1,000,000. Comparability ratio applied to account for coding conversion from ICD-9 to ICD-10 in 1999.

Rates are not displayed if fewer than 10 events were reported (noted as -).

Source: CDC WONDER

Comment: *Healthy People 2010* includes an objective to reduce mortality from asthma to one death per million among children 0 to 4 and 5 to 14 years of age, three per million among persons 15-34 years of age, nine per million among persons 35-64, and 60 per million among persons 65 and older.¹ Age-specific asthma mortality rates for New Hampshire residents could only be calculated for the two oldest age groups due to the small number of deaths among persons less than 35 years of age. Approximately 61% of all asthma deaths from 1998-2002 occurred among persons aged 65 and older. Mortality rates were calculated using the total number of asthma deaths in each age group for the 5-year periods indicated in the table for the numerator and the total age-specific population for these time periods for the denominator.

It appears that asthma mortality rates among adults 35-64 years old and 65 and older have declined over time; however, since the numbers are so small this may be due to chance alone.

Despite the apparent decrease among adults 65 years and older, rates for 1998-2002 were higher than *Healthy People 2010* target rates for this age group.

5. ASTHMA PREVALENCE AND TOBACCO SMOKE EXPOSURE AMONG MIDDLE AND HIGH SCHOOL STUDENTS

Asthma is one of the most common chronic diseases in children and is the most common cause of school absenteeism due to chronic conditions. The direct cost of asthma among school-aged children (5 to 17 years) in the US was estimated at 1 billion dollars in 1996. Direct costs of asthma include: prescribed medicine, outpatient and office visits, hospitalizations, and emergency room care. On average a child with asthma has approximately 424 dollars more in medical costs per year than a child without asthma. A child with asthma misses approximately 2.5 more days of school than a child without asthma. The indirect cost of asthma was estimated to be 984 million. Indirect costs include non-medical economic losses such as days missed from school or work, caregiver costs, travel costs, and years of productive life lost. More than half of indirect costs and a fifth of direct costs are preventable with effective interventions.²⁰

The 2004 New Hampshire Youth Tobacco Survey (YTS) is the third comprehensive survey of tobacco related knowledge, attitudes and behaviors among New Hampshire public school students. This survey is administered to public middle and high school students; all information gathered from the survey is self-reported. With the permission of the New Hampshire Tobacco Prevention and Control Program, which conducts the New Hampshire YTS, the New Hampshire Asthma Control Program (NHACP) added two asthma prevalence questions to the 2004 YTS, which allowed the NHACP to obtain an estimated prevalence of asthma among middle and high school students. Until now, it has been difficult to obtain asthma prevalence information for this population. In the coming years, other data sources will be available such as the Asthma Call-back Survey, which will provide additional information on the prevalence and management of asthma in children in addition to information on missed school days, cost of care, and knowledge about asthma.

This section presents data from the 2004 New Hampshire YTS. It includes information on middle and high school students with lifetime and current asthma, and exposure to secondhand smoke. Data were analyzed by grade level and gender where possible to determine whether asthma prevalence varied by these demographic factors.

For a complete report on the 2004 New Hampshire Youth Tobacco Survey, contact:

New Hampshire Department of Health and Human Services
Division of Public Health Services
Bureau of Prevention Services
Tobacco Prevention and Control Program
29 Hazen Drive, Concord, New Hampshire 03301-6504
Phone: 603-271-6891 or 1-800-852-3345 ext: 6891
TDD Access: 1-800-735-2964

METHODS

DEFINITIONS:

Lifetime asthma refers to the number of people who answered “yes” to the question: “Have you ever been told by a doctor, nurse, or other health professional that you had asthma?”

Current asthma refers to the number of people who answered “yes” to two questions: “Have you ever been told by a doctor, nurse, or other health professional that you had asthma?” and “Do you still have asthma?”

Middle school students are students in grades six through eight.

High school students are students in grades nine through twelve.

DATA SOURCE AND QUALITY OF DATA:

Youth Tobacco Survey

The 2004 New Hampshire YTS was conducted during October and November of 2004 in New Hampshire public middle and high schools. Fifty middle schools and 50 high schools were randomly selected to participate in the survey. Results were obtained anonymously through a paper and pencil questionnaire, which was developed in collaboration with the CDC and other states participating in the YTS. The CDC also developed the sample design and survey administration protocols.

A total of 3,488 students, in 83 schools and 55 towns and cities across New Hampshire, participated in the survey. Forty-two of the fifty middle schools and forty-one of the fifty high schools selected in the sample agreed to participate in the survey. There was at least one participating school for each county in New Hampshire. The overall response rate was 75.6% for the middle school sample and 73% for the high school sample.

The 2004 New Hampshire YTS data were weighted to adjust for non-response and to make them representative of New Hampshire middle and high school students for these grade levels.

Although race/ethnicity is asked in the survey, results are not analyzed by race/ethnicity. The low proportion of minorities in New Hampshire results in a small number of individuals from minority ethnic or racial groups in the YTS sample. The number sampled is too small to provide reliable prevalence estimates for these groups.

The data presented here may be viewed as representative of public middle and high school students in New Hampshire. One limitation of the data is that they do not represent youth who are not enrolled in public schools. This includes private school students, those who are home schooled, and those who have dropped out of school. In 2003-2004, 9.8% of New Hampshire middle and high school students were enrolled in non-public schools, 1.3% were home schooled, and the annual high school dropout rate for public schools was 3.8%.²¹

Since behaviors are self-reported, potential sources of error for the YTS are inaccurate recall and response bias, which may result in under- or over-estimation of specific behaviors or conditions.

For a more detailed description of the survey, refer to the *2004 New Hampshire Youth Tobacco Survey* report.²²

ANALYSIS:

Analysis of the 2004 New Hampshire YTS was done with SAS (Statistical Analysis Software) and SUDAAN (Software for Statistical Analysis of Correlated Data) to account for the complex sampling design of the survey.

The lifetime asthma prevalence rate is calculated by dividing the number of people who reported lifetime asthma by the number of people who responded either “yes” or “no” to the lifetime asthma question.

The current asthma prevalence rate is calculated by dividing the number of people who report current asthma by the number of people who report having no asthma or current asthma, or lifetime asthma and not current asthma. Respondents who did not answer “yes” or “no” to the lifetime asthma question were excluded, and those who said they had lifetime asthma but did not answer “yes” or “no” to the question, “Do you still have asthma?” were excluded.

National Comparisons

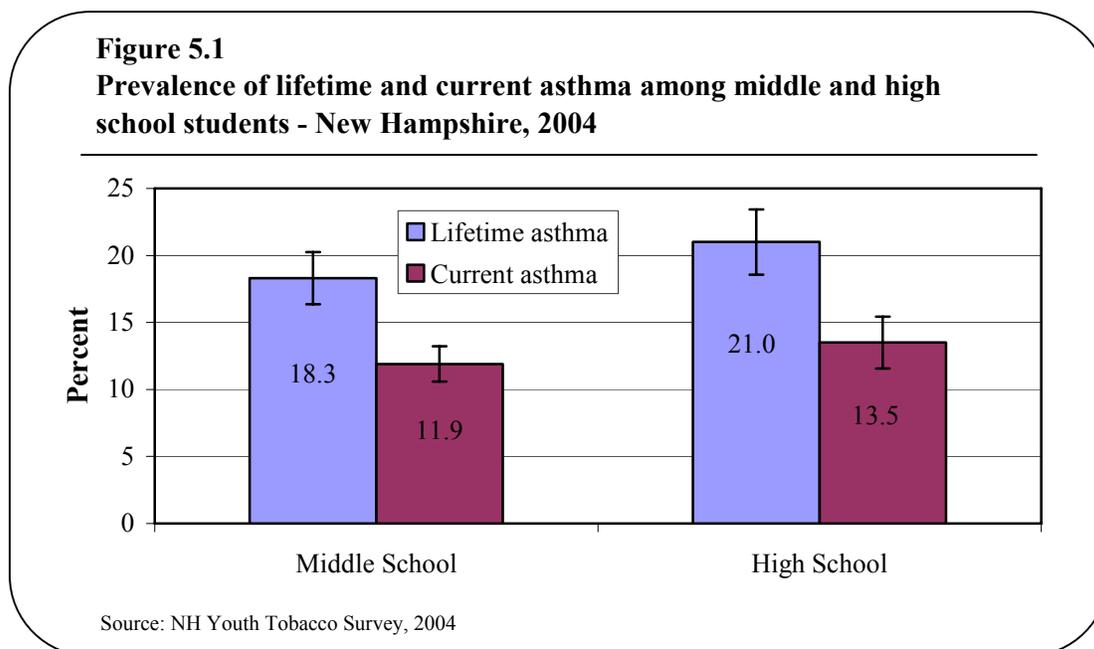
There is a national YTS but it does not contain questions related to asthma.

Confidence Intervals

95% confidence intervals are presented along with point estimates for survey data. Because this information was collected from a sample of the population, each percentage is an estimate of the true prevalence.

Asthma in Middle and High School Students

Figure 5.1 shows the prevalence of lifetime and current asthma among middle and high school students in New Hampshire in 2004.



Comment: Overall in 2004, 18.3% (95% CI: 16.4-20.2) of New Hampshire middle school students reported being told sometime in their life that they had asthma, and approximately 11.9% (95% CI: 10.6-13.2) reported having current asthma.

Lifetime asthma prevalence for New Hampshire high school students was 21.0% (95% CI: 18.6-23.4) and current asthma prevalence was 13.5% (95% CI: 11.6-15.4).

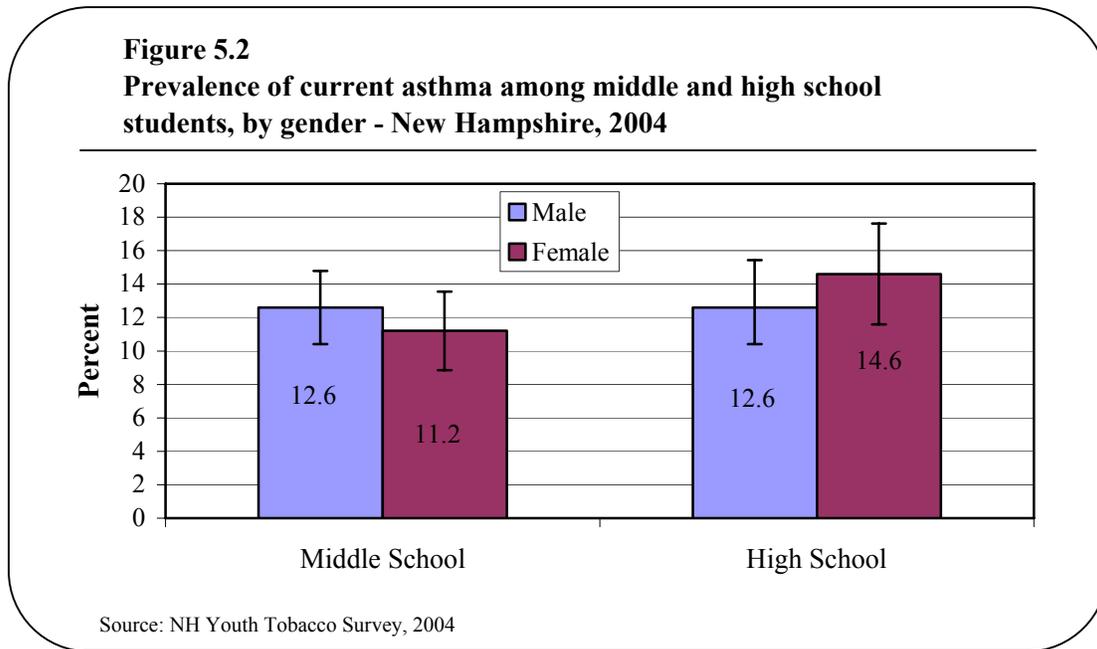
New Hampshire high school students reported higher prevalence of both lifetime and current asthma compared to New Hampshire middle school students; however, this difference was not statistically significant.

Table 5.1
Prevalence of lifetime and current asthma among middle and high school students - New Hampshire, 2004

	Middle School			High School		
	N	Percent	(95% CI)	N	Percent	(95% CI)
Lifetime asthma	263	18.3	(16.4-20.2)	281	21.0	(18.6-23.4)
Current asthma	170	11.9	(10.6-13.2)	181	13.5	(11.6-15.4)

Source: NH Youth Tobacco Survey, 2004

Figure 5.2 compares the prevalence of current asthma among middle and high school students in New Hampshire by gender.



Comment: In 2004, approximately 12.6% (95% CI: 10.4-14.8) of male middle school students and 11.2% (95% CI: 8.8- 13.6) of female middle school students in New Hampshire said they had current asthma.

Approximately 12.6% (95% CI: 9.8-15.4) of male high school students and 14.6% (95% CI: 11.6-17.6) of female high school students in New Hampshire said they had current asthma.

Male middle school students had a higher prevalence of asthma than females. However, among high school students, females had a higher prevalence of asthma than males. A similar age-gender change has been observed in other data sources such as the BRFSS, and inpatient and outpatient hospital discharge data.

Table 5.2
Prevalence of current asthma among middle and high school students, by gender - New Hampshire, 2004

Gender	Middle School			High School		
	N	Percent	(95% CI)	N	Percent	(95% CI)
Male	92	12.6	(10.4-14.8)	82	12.6	(9.8-15.4)
Female	77	11.2	(8.8-13.6)	99	14.6	(11.6-17.6)
Total	170	11.9	(10.6-13.2)	181	13.5	(11.6-15.4)

Source: NH Youth Tobacco Survey, 2004

Smoking Among Students with Asthma

Table 5.3 compares high school students in New Hampshire who have asthma and currently smoke to those who do not have asthma and currently smoke.

Table 5.3
Percent of high school students who currently smoke*, by asthma status -
New Hampshire, 2004

	N	Percent	(95% CI)
Current Asthma	47	26.3	(11.8-24.0)
No Asthma	293	27.4	(14.6-22.6)

*Smoked any of the following: cigarettes, tobacco pipe, cigars, bidis, or kreteks one or more times in the last 30 days.
 Source: NH Youth Tobacco Survey, 2004

Comment: Approximately 8.4% (95% CI: 6.3-10.5) of New Hampshire middle school students and 28.1% (95% CI: 23.9-32.3) of high school students reported currently smoking - data not shown.

No statistically significant differences were observed between high school students with asthma who currently smoke and those without asthma who currently smoke.

The numbers were too small to calculate the percent of middle school students who currently smoke by asthma status.

Definitions:

A *current smoker* was defined as having smoked any of the following: cigarettes, tobacco pipe, cigars, bidis, or kreteks one or more times in the last 30 days.

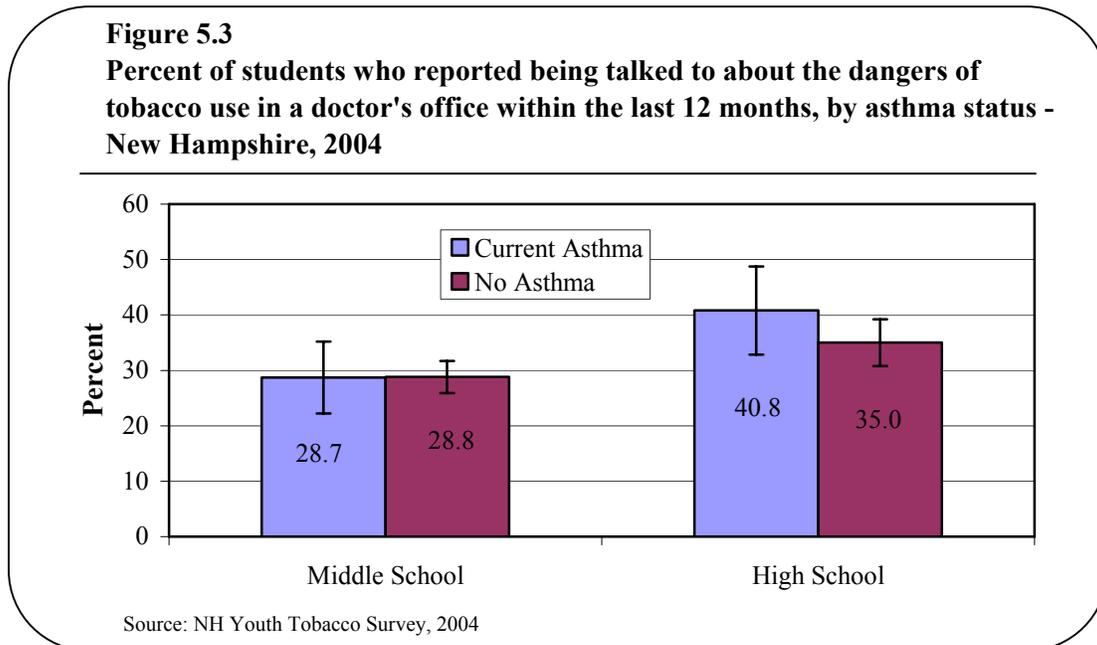
Bidis are small, thin cigarettes imported from India or other Southeast Asian countries consisting of tobacco wrapped in a leaf and secured with a colorful string.

Kreteks (also called clove cigarettes) are flavored cigarettes containing tobacco and clove extract.

Bidis and kreteks are two emerging tobacco products in the United States.

Smoking Prevention

Figure 5.3 compares middle and high school students in New Hampshire with and without asthma who have reported being talked to about the dangers of tobacco use in a doctor's office within the last 12 months.



Comment: There are no statistically significant difference between New Hampshire middle and high school students who reported being talked to by someone in a doctor's office about the dangers of tobacco use by asthma status. High school students reported being talked to more often than middle school students.

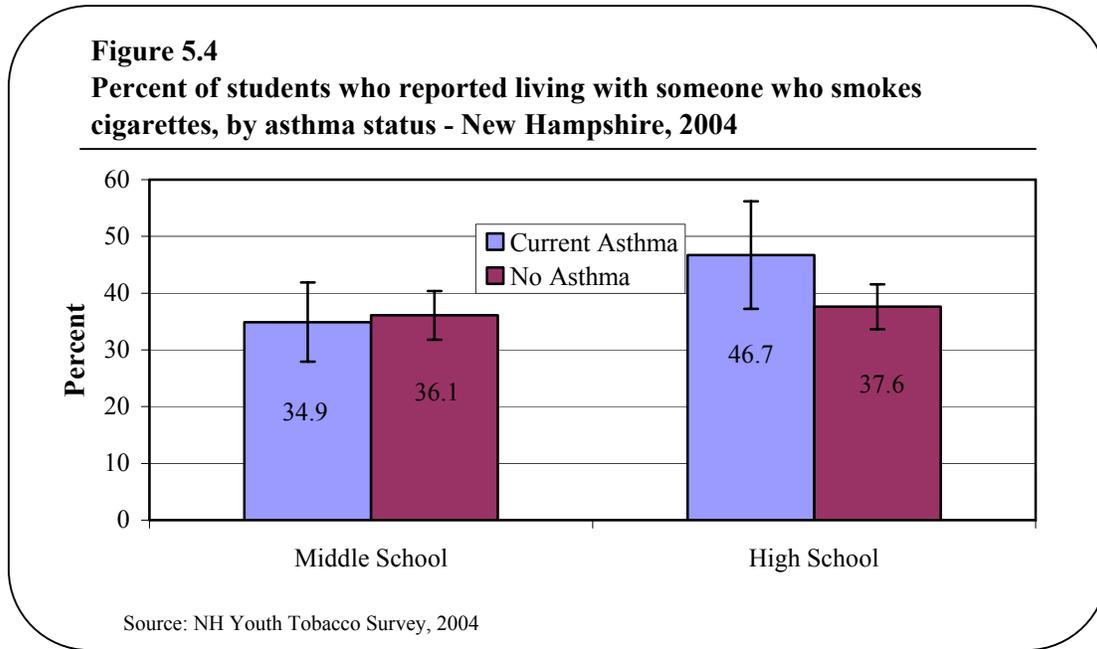
Table 5.4
Percent of students who reported being talked to about the dangers of tobacco use in a doctor's office within the last 12 months, by asthma status - New Hampshire, 2004

	Middle School			High School		
	N	Percent	(95% CI)	N	Percent	(95% CI)
Current Asthma	43	28.7	(22.2-35.2)	69	40.8	(32.9-48.7)
No Asthma	338	28.8	(25.9-31.7)	371	35.0	(30.8-39.2)

*Excludes those who did not visit a doctor's office in the last 12 months.
 Source: NH Youth Tobacco Survey, 2004

Exposure to Secondhand Smoke

Figure 5.4 compares middle and high school students in New Hampshire with and without asthma who reported living with someone who smokes cigarettes.



Comment: New Hampshire middle school students who have asthma are just as likely to report living in a home with someone who smokes as those who do not have asthma.

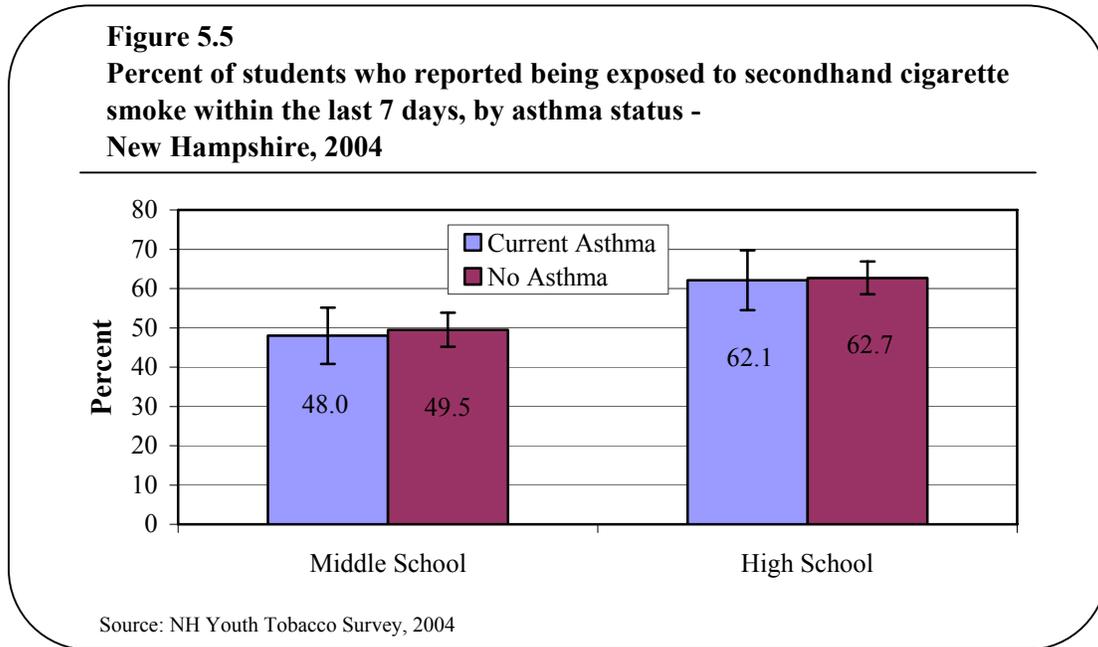
Approximately 46.7% (95% CI: 37.2- 56.2) of New Hampshire high school students who have asthma report living with someone who smokes, compared to 37.6% (95% CI: 33.7- 41.5) of high school students who do not have asthma; this difference is not statistically significant.

Table 5.5
Percent of students who reported living with someone who smokes cigarettes, by asthma status - New Hampshire, 2004

	Middle School			High School		
	N	Percent	(95% CI)	N	Percent	(95% CI)
Current Asthma	58	34.9	(27.9-41.9)	80	46.7	(37.2-56.2)
No Asthma	454	36.1	(31.8-40.4)	426	37.6	(33.7-41.5)

Source: NH Youth Tobacco Survey, 2004

Figure 5.5 compares middle and high school students in New Hampshire with and without asthma who reported being exposed to secondhand cigarette smoke within the last 7 days.



Comment: Just under 50% of middle school students and over 50% of high school students reported being exposed to secondhand cigarette smoke in the last 7 days. However, there are no statistically significant differences by asthma status.

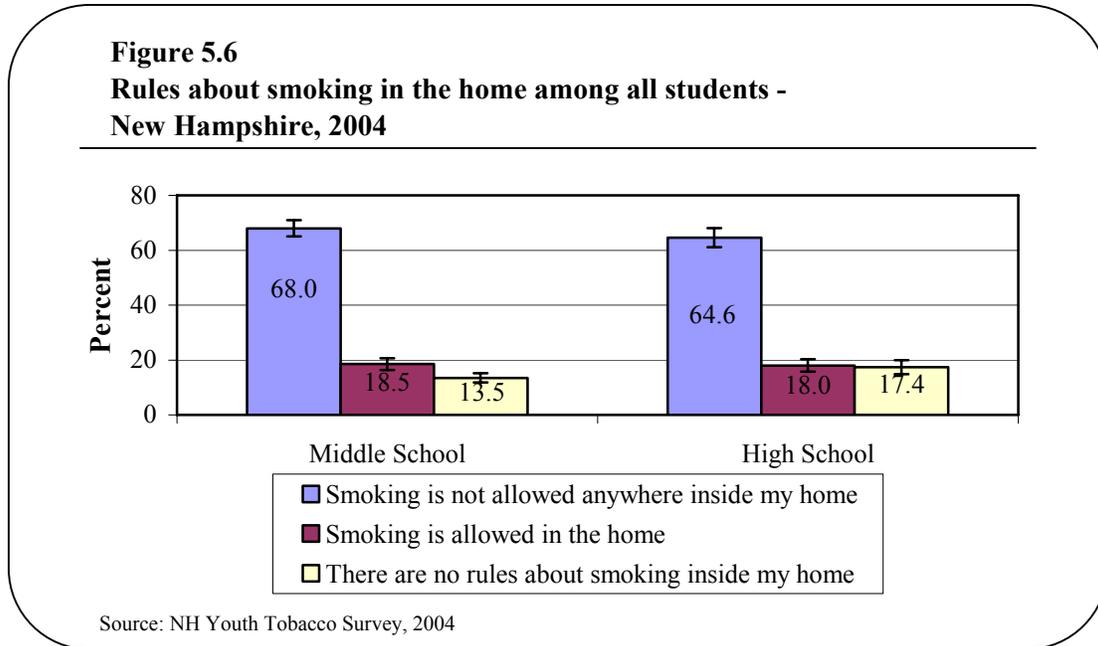
Exposure to secondhand smoke was defined as either being in the car or in a home with someone who was smoking at least once in the last 7 days.

Table 5.6
Percent of students who reported being exposed to secondhand cigarette smoke within the last 7 days, by asthma status - New Hampshire, 2004

	Middle School			High School		
	N	Percent	(95% CI)	N	Percent	(95% CI)
Current Asthma	80	48.0	(40.8-55.2)	113	62.1	(54.5-69.7)
No Asthma	625	49.5	(45.2-53.8)	714	62.7	(58.5-66.9)

Source: NH Youth Tobacco Survey, 2004

Figure 5.6 shows the percent of middle and high school students in New Hampshire who have rules about smoking in the home.



Comment: In 2004, approximately two thirds of both middle and high school students in New Hampshire reported living in a house where smoking is not allowed (there are no statistically significant differences by asthma status – data not shown).

Table 5.7
Rules about smoking in the home among all students –
New Hampshire, 2004

	Middle School			High School		
	N	Percent	(95% CI)	N	Percent	(95% CI)
Smoking is not allowed anywhere inside my home	1074	68.0	(65.1-70.9)	923	64.6	(61.1-68.1)
Smoking is allowed in the home	289	18.5	(16.3-20.7)	253	18.0	(15.7-20.3)
There are no rules about smoking inside my home	206	13.5	(11.8-15.2)	237	17.4	(14.9-19.9)

Source: NH Youth Tobacco Survey, 2004

6. MEDICAID DATA

Medicaid enrollees are a vulnerable population for asthma exacerbations. Members are typically children less than 19 years and pregnant women whose family income is less than 185% of the federal poverty limit; physically or mentally disabled children and adults who have few economic resources; and the elderly who have limited economic resources. The prevalence of asthma is higher among adults who have a family income of less than 15,000 dollars than among adults whose family income is higher (see *Figure 1.11*). Children with asthma and enrolled in Medicaid use the emergency department more frequently than children enrolled in other insurance programs.²³

Medicaid data are used to help determine which subpopulations of Medicaid enrollees are most vulnerable and describe how well members manage their asthma. This data source has the potential to describe the types of services utilized as well as prescriptions filled. However, since Medicaid data are based on claims, the data set only captures covered benefits and services that are billed. It does not give information on test results or prescriptions written by physicians.

This section presents data on New Hampshire's Medicaid population from 2001-2004. It includes information on the prevalence of all asthma and persistent asthma among Medicaid enrollees. Data were analyzed by age and gender where possible to determine whether asthma varied by these demographic factors. Future reports will include information on the use of services and charges.

Because the Medicaid population is defined by eligibility criteria, it is not representative of the population at large and conclusions drawn from the data are only applicable to the Medicaid population. Medicaid offers several programs that provide subsidized medical insurance (e.g., Healthy Kids Sliver), but the claims from these programs are not processed by Medicaid and so are not included in the Medicaid claims database or this report.

METHODS

DEFINITIONS FOR PREVALENCE ANALYSIS:

All Asthma ²⁴	Persistent Asthma
Individuals are identified as asthma patients if during a calendar year they were enrolled in Medicaid for at least 11 months and had at least:	Using the National Committee for Quality Assurance's (NCQA) Health Plan Employer Data Information Set (HEDIS) definition, individuals are identified as having persistent asthma if during a calendar year they were enrolled in Medicaid for at least 11 months and had at least:
One outpatient asthma visit (ICD-9CM code 493); or	Four outpatient asthma visits (ICD-9CM code 493) and at least two asthma medication dispensing events; or
One emergency department visit with a principle diagnosis of asthma (ICD-9CM code 493); or	One emergency department visit with a principle diagnosis of asthma (ICD-9CM code 493); or
One acute inpatient discharge with a principle diagnosis of asthma (ICD-9CM code 493); or	One acute inpatient discharge with a principle diagnosis of asthma (ICD-9CM code 493); or
Four asthma medication dispensing events	Four asthma medication dispensing events

Eligibility for Medical Services Paid by Medicaid

Low income: children under 19 years, pregnant women, families with children, blind individuals, seniors, and physically and mentally disabled adults are eligible to be enrolled in Medicaid. Some programs offered through Medicaid have premiums (e.g., Healthy Kids Silver); the claims from these programs are not processed by Medicaid and therefore not in the Medicaid claims database. As a result the Medicaid claims database does not provide information on all people Medicaid covers.

Refer to <http://www.dhhs.nh.gov/DHHS/MEDASSISTELIG/ELIGIBILITY/default.htm> for New Hampshire Medicaid eligibility requirements.

DATA SOURCE AND QUALITY OF DATA:

Medicaid Claims Data

Medicaid data are collected for administrative purposes and are set up for cost analysis, not for public health surveillance. The Medicaid population is determined by eligibility criteria and so is not representative of the population at large: any conclusions drawn from Medicaid data can only be applied to the Medicaid population and not the population at large. This data source does not capture anything that is not a covered benefit or that is not billed. One data quality issue is billing/coding because billing practices may vary among providers.

ANALYSIS:

Medstat Decision Analyst is a query-based system that is used to access New Hampshire's Medicaid database.

Analyses on prevalence of all asthma and persistent asthma are limited to members enrolled 11 out of 12 months during a calendar year.

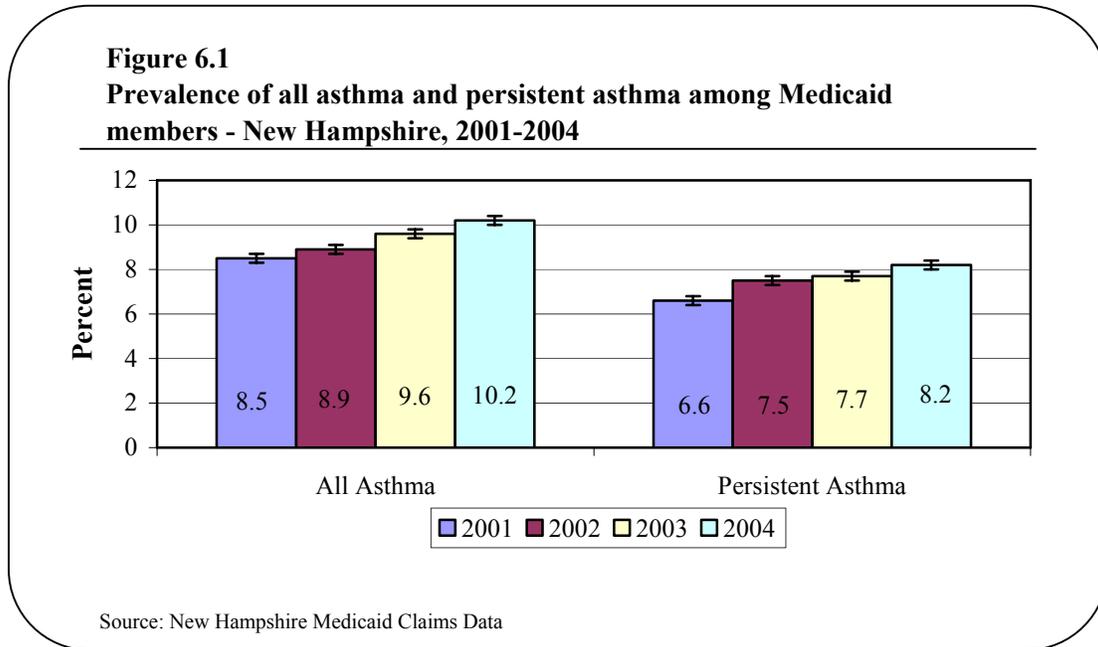
National Comparisons

There are no national data available at this time for Medicaid data.

Confidence Intervals

Although these data are not from a survey and all claims submitted to Medicaid have been captured, confidence intervals still serve a purpose. The confidence intervals help to determine if the prevalence and rates seen from year to year and between groups are due to expected fluctuations based on the number of members with asthma and the size of the Medicaid population or if they are statistically different from one year to the next or between groups. Appendix C gives the formulas used to calculate 95% confidence intervals.

Figure 6.1 shows the prevalence of all asthma and persistent asthma among Medicaid members in New Hampshire from 2001-2004.



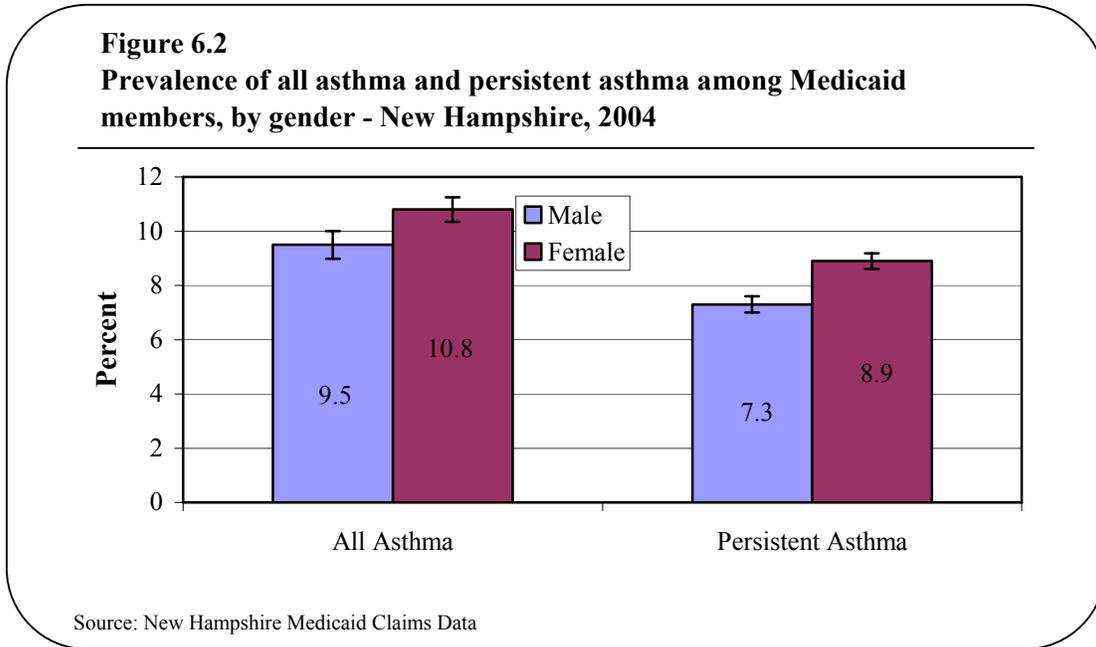
Comment: The prevalence of asthma and persistent asthma has increased among Medicaid members over time. Approximately 80% of all individuals in the Medicaid population with asthma have persistent asthma.

Table 6.1
Prevalence of all asthma and persistent asthma among Medicaid members – New Hampshire, 2001-2004

	All Asthma			Persistent Asthma		
	N	Percent	95% CI	N	Percent	95% CI
2001	4895	8.5	(8.3-8.7)	3837	6.6	(6.4-6.8)
2002	5664	8.9	(8.7-9.1)	4756	7.5	(7.3-7.7)
2003	6608	9.6	(9.4-9.8)	5278	7.7	(7.5-7.9)
2004	7486	10.2	(10.0-10.4)	5975	8.2	(8.0-8.4)

Source: New Hampshire Medicaid Claims Data

Figure 6.2 compares the prevalence of all asthma and persistent asthma among Medicaid members in New Hampshire in 2004, by gender



Comment: Females have a higher prevalence of asthma than males in New Hampshire’s Medicaid population; this pattern is observed in other data sets as well. In addition, approximately 76.8% of males and 82.4% of females with asthma have persistent asthma.

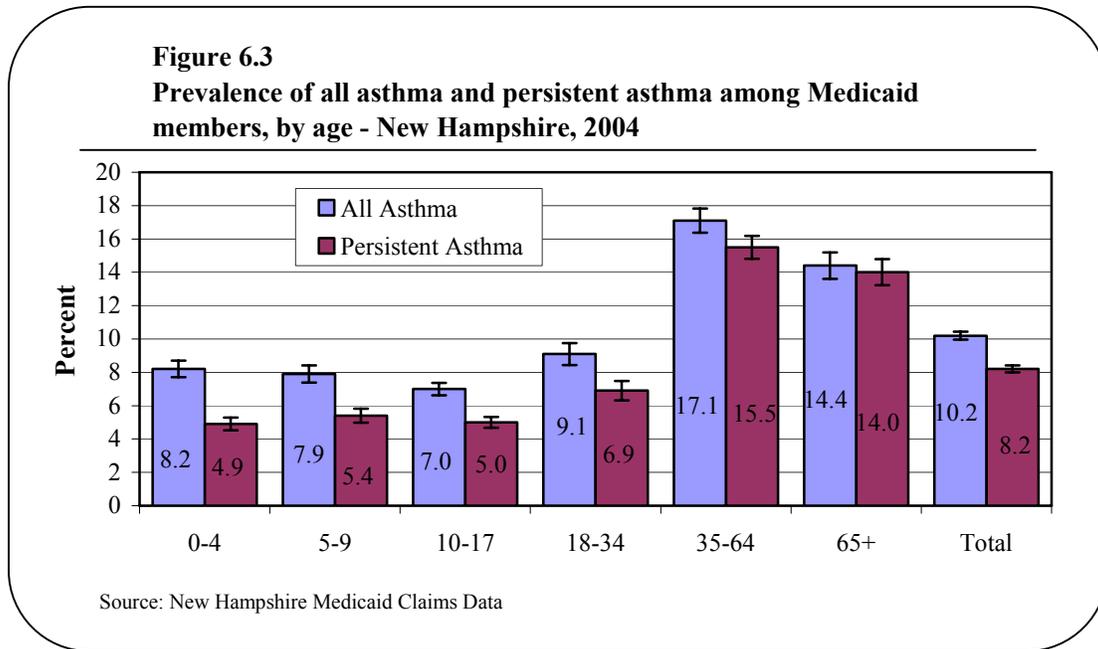
The prevalence of asthma among both male and female Medicaid members in New Hampshire has increased from 2001-2004 – data not shown.

Table 6.2
Prevalence of all asthma and persistent asthma among Medicaid members, by gender – New Hampshire, 2004

Gender	All Asthma			Persistent Asthma		
	N	Percent	95% CI	N	Percent	95% CI
Male	1343	9.5	(9.0-10.0)	2268	7.3	(7.0-7.6)
Female	2244	10.8	(10.4-11.2)	3708	8.9	(8.6-9.2)

Source: New Hampshire Medicaid Claims Data

Figure 6.3 compares the prevalence of all asthma and persistent asthma among Medicaid members in New Hampshire in 2004, by age group.



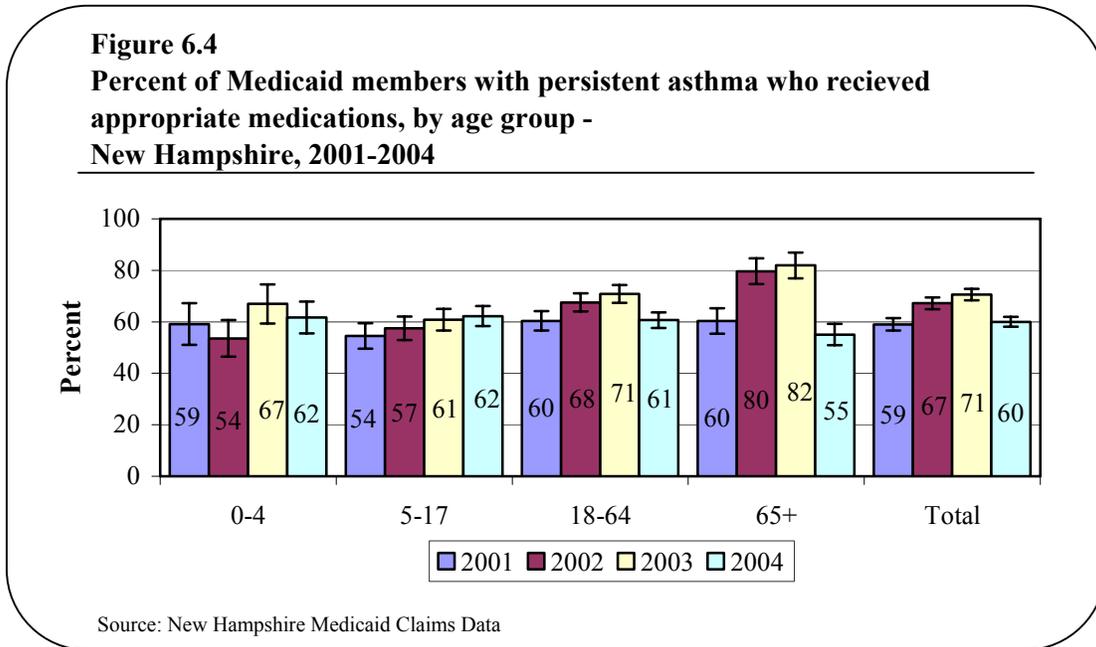
Comment: The prevalence of persistent asthma among Medicaid members with asthma increases with age. It is least prevalent among children aged 0-4 years (59.8%) and most prevalent among adults 65 years and older (97.2%).

Table 6.3
Prevalence of all asthma and persistent asthma among Medicaid members, by age – New Hampshire, 2004

Age Group	N	All Asthma		Persistent Asthma		
		Percent	95% CI	N	Percent	95% CI
0-4	1053	8.2	(7.7-8.7)	629	4.9	(4.5-5.3)
5-9	926	7.9	(7.4-8.4)	640	5.4	(5.0-5.8)
10-17	1333	7.0	(6.6-7.4)	948	5.0	(4.7-5.3)
18-34	729	9.1	(8.5-9.7)	553	6.9	(6.3-7.5)
35-64	2179	17.1	(16.4-17.8)	1973	15.5	(14.9-16.1)
65+	1266	14.4	(13.7-15.1)	1232	14.0	(13.3-14.7)
Total	7486	10.2	(10.0-10.4)	5975	8.2	(8.0-8.4)

Source: New Hampshire Medicaid Claims Data

Figure 6.4 shows the percent of Medicaid members in New Hampshire with persistent asthma in 2001-2004 who received appropriate medications according to HEDIS definitions of persistent asthma and appropriate asthma medications, by age group.



Comment: From 2001 to 2003, there was an increase in the percent of Medicaid members with persistent asthma who were appropriately medicated in New Hampshire across all age groups. In 2004, there was a drop and this decrease is most dramatic in the older age groups. The list of appropriate medications is updated annually by HEDIS. The 2003 list was more inclusive than the list for 2004 as well as the lists for prior years, which may explain the higher proportion of Medicaid members with persistent asthma who were appropriately medicated in 2003.

Table 6.4
Percent of Medicaid members with persistent asthma who received appropriate medications, by age group – New Hampshire, 2001-2004

	0-4			5-17			18-64			65+			Total		
	N	Percent	95% CI	N	Percent	95% CI	N	Percent	95% CI	N	Percent	95% CI	N	Percent	95% CI
2001	207	59.1	(54.0-64.2)	462	54.5	(51.1-57.9)	1009	60.4	(58.1-62.7)	584	60.3	(57.2-63.4)	2262	59.0	(57.4-60.6)
2002	218	53.6	(48.8-58.4)	615	57.5	(54.5-60.5)	1388	67.5	(65.5-69.5)	975	79.7	(77.4-82.0)	3196	67.2	(65.9-68.5)
2003	298	67.0	(62.6-71.4)	799	60.8	(58.2-63.4)	1617	70.9	(69.0-72.8)	1013	81.9	(79.8-84.0)	3727	70.6	(69.4-71.8)
2004	388	61.7	(57.9-65.5)	988	62.2	(59.8-64.6)	1532	60.6	(58.7-62.5)	678	55.0	(52.2-57.8)	3586	60.0	(58.8-61.2)

Source: New Hampshire Medicaid Claims Data

Conclusion

The NH Asthma Surveillance Report for 1990-2004 documents trends in asthma prevalence, health care utilization, and mortality due to asthma; it also provides data on health status, the control and management of asthma, and related health concerns such as tobacco use and exposure to secondhand smoke, influenza immunization, and obesity. It helps identify vulnerable populations and potential areas for public health intervention.

Prevalence and Health Care Utilization: Along with the other New England states, New Hampshire has among the highest asthma prevalence rates in the country. To understand why this is the case will require focused research. Despite the relatively high rates of asthma, however, it is important to note that New Hampshire's hospitalization rates for asthma are significantly lower than national rates, and the rate of emergency department visits are equivalent to rates among US whites. Do the relatively favorable hospitalization and emergency department rates signify good access to primary care and appropriate management and control of asthma, poor access to health institutions in rural settings, a population with frequent symptoms of asthma but moderate severity of disease, and/or a population with severe exacerbations that does not seek health care? It is not clear at this time.

Vulnerable Populations: As in other states, asthma is most prevalent among male children and adult females, and females have the highest rates of hospitalization, emergency department use, and mortality. Of the different age groups, children 0-4 years old and adults 65 and older have the highest rates of hospitalization for asthma, and children 0-4 and adults 15-34 have the highest rates of emergency department use. Clearly, clinical, education, and public health interventions need to focus on understanding how and why women and the age groups listed above are adversely affected and how to improve their health outcomes.

Asthma Management and Health Status: High proportions of adults with asthma report the following: that they have symptoms at least once a week, that they did not have a routine asthma checkup in the past year, that they did not have a flu shot, and that they smoke and are overweight or obese. Middle and high school students with asthma are as likely as those without asthma to report being exposed to secondhand smoke and over a third of these students live with someone who smokes; yet only a third report being talked to about tobacco use in a doctor's office. Based on these limited data, interventions are indicated that focus on social policy (e.g., secondhand smoke exposure in public spaces), behavior change (e.g., smoking and weight status), and clinical improvement (e.g., asthma education, flu immunization status, annual asthma visits).

Future Directions: Several gaps in our knowledge of asthma and the impact it has in New Hampshire stand out. Nationally the prevalence of asthma and inpatient and outpatient hospitalizations due to asthma vary by race and ethnicity, with racial and ethnic groups disproportionately adversely affected according to some indicators. New Hampshire has a very small minority population and asthma data for these groups are lacking. It is hoped data will become available over time as the numbers among racial and ethnic groups grow. Other gaps include information on work-related asthma, insurance claims data, and local level data. Future reports will address each of these gaps:

- ❖ The 2005 BRFSS asks two work-related asthma questions and the BRFSS Call-back Survey, which includes other work-related asthma questions, is scheduled for 2006 and 2007.
- ❖ The New Hampshire Comprehensive Health Information System is now collecting private and public insurance claims data so that more detailed information on the use and cost of health care services will become available over the next few years.
- ❖ The New Hampshire BRFSS for 2005 and 2006 is stratified by county prior to sampling in the hopes that local level prevalence data will be available for the first time. In addition, hospitalization, Medicaid, and private insurance claims data can be stratified in a variety of ways to look at smaller geographic areas. Data by geographic area will help clarify potential rural/urban disparities and afford the public needed information for local decision-making.

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APPENDIX A: NEW HAMPSHIRE BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM ASTHMA QUESTIONS

ADULT ASTHMA CORE QUESTIONS

2000 BRFSS:

1. Did a doctor ever tell you that you had asthma?
 - a. Yes
 - b. No
 - c. Don't know/Not sure
 - d. Refused
2. Do you still have asthma?
 - a. Yes
 - b. No
 - c. Don't know/Not sure
 - d. Refused

2001-2004 BRFSS:

1. Have you ever been told by a doctor, nurse, or other health professional that you had asthma?
 - a. Yes
 - b. No
 - c. Don't know/Not sure
 - d. Refused
2. Do you still have asthma?
 - a. Yes
 - b. No
 - c. Don't know/Not sure
 - d. Refused

ADULT ASTHMA HISTORY MODULE*, 2004

1. How old were you when you were first told by a doctor, nurse, or other health professional that you had asthma?
 - a. ____ Age in years
 - b. Don't know/Not sure
 - c. Refused
2. During the past 12 months, have you had an episode of asthma or an asthma attack?
 - a. Yes
 - b. No
 - c. Don't know/ Not sure
 - d. Refused

3. During the past 12 months, how many times did you visit an emergency room or urgent care center because of your asthma?
 - a. _____ Number of visits
 - b. None
 - c. Don't know/Not sure
 - d. Refused
4. During the past 12 months, how many times did you see a doctor, nurse, or other health professional for urgent treatment of worsening asthma symptoms?
 - a. _____ Number of visits
 - b. None
 - c. Don't know/Not sure
 - d. Refused
5. During the past 12 months, how many times did you see a doctor, nurse, or other health professional for a routine checkup for your asthma?
 - a. _____ Number of visits
 - b. None
 - c. Don't know/Not sure
 - d. Refused
6. During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?
 - a. _____ Number of days
 - b. None
 - c. Don't know/Not sure
 - d. Refused
7. Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness, and phlegm production when you don't have a cold or respiratory infection. During the past 30 days, how often did you have any symptoms of asthma?
 - a. Not at any time
 - b. Less than once a week
 - c. Once or twice a week
 - d. More than 2 times a week, but not every day
 - e. Every day, but not all the time
 - f. Every day, all the time
 - g. Don't know/Not sure
 - h. Refused
8. During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?
 - a. None
 - b. One or two
 - c. Three or four
 - d. Five
 - e. Six or ten
 - f. More than ten
 - g. Don't know/Not sure
 - h. Refused

9. During the past 30 days how often did you take asthma medication that was prescribed or given to you by a doctor? This includes using an inhaler
- Didn't take any
 - Less than once a week
 - Once or twice a week
 - More than 2 times a week, but not every day
 - Once every day
 - 2 or more times every day
 - Don't know/Not sure
 - Refused

*Question 1 was asked to adults who answered, "yes" to "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" Questions 2-9 were only asked of adults that answered "yes" to both core questions listed above (i.e., had current asthma).

CHILDHOOD ASTHMA MODULE

2000 BRFSS:

- Did a doctor ever tell you that a child of yours has asthma?
 - Yes
 - No
 - Don't know/Not sure
 - Refused
- Does your child take medication for his/her asthma?
 - Yes
 - No
 - Don't know/Not sure
 - Refused

2001-2004 BRFSS:

- Earlier you said there were (#) children age 17 or younger living in your household. How many of these children have ever been diagnosed with asthma?
 - ____ Number of children
 - None
 - Don't know/Not sure
 - Refused
- How many of these children still have asthma?
 - ____ Number of children
 - None
 - Don't know/Not sure
 - Refused

APPENDIX B: HEALTHY PEOPLE 2010 AND HEALTHY NEW HAMPSHIRE 2010 OBJECTIVES FOR ASTHMA

HEALTHY PEOPLE 2010 OBJECTIVES

- 24-1. Reduce asthma deaths
 - From 2.1 per million to 1.0 per million in children less than 5 years of age
 - From 3.3 per million to 1.0 per million in children 5 to 14 years of age
 - From 5.0 per million to 3.0 per million in persons 15 to 34 years of age
 - From 17.8 per million to 9.0 per million in persons 35 to 64 years of age
 - From 86.3 per million to 60.0 per million in persons 65 years of age and older

- 24-2. Reduce hospitalizations for asthma
 - From 45.6 per 10,000 to 25 per 10,000 in children less than 5 years of age
 - From 12.5 per 10,000 to 7.7 per 10,000 in persons 5 to 64 years of age and older
 - From 17.7 per 10,000 to 11 per 10,000 in persons 65 years of age and older

- 24-3. Reduce hospital emergency department visits for asthma
 - From 150.0 per 10,000 to 80 per 10,000 in children less than 5 years of age
 - From 71.1 per 10,000 to 50 per 10,000 in persons 5 to 64 years of age
 - From 29.5 per 10,000 to 15 per 10,000 in persons 65 years of age and older

- 24-4. Reduce activity limitations among persons with asthma from 1994-1996 baseline level of 20% to 10% by 2010.

- 24-5. Reduce the number of school or workdays missed by persons with asthma due to asthma. (Developmental)

- 24-6. Increase the proportion of persons with asthma who receive formal patient education, including information about community and self-help resources, as an essential part of the management of their condition from 1998 baseline level of 8.4% to 30% by 2010. (Developmental)

- 24-7. Increase the proportion of persons with asthma who receive appropriate asthma care according to NAEPP Guidelines. (Developmental)

- 24-8. Establish in at least 25 states a surveillance system for tracking asthma death, illness, disability, impact of occupational and environmental factors on asthma, access to medical care, and asthma management. (Developmental)

HEALTHY NEW HAMPSHIRE 2010 OBJECTIVES

Reduce hospitalizations for pediatric asthma (0 to 17 years of age) from a 1998 baseline level of 10.5 per 10,000 to 7.9 per 10,000 by 2010.

APPENDIX C: TECHNICAL NOTES

This appendix was inspired by the *Leading Causes of Death of New Hampshire Residents, 1999-2001* report and included with the authors' permission.* The examples were modified slightly to fit this report.

AGE-ADJUSTED RATES

To compare populations where the distribution of age is different, an adjustment or standardization needs to be made. For example, if New Hampshire and the US are compared for rates of asthma hospitalizations and one of them has a higher percent of adults 65 and older and children 0-4, the one with the higher percent of adults 65 and older and children 0-4 will probably show higher rates of hospitalizations due to asthma as a result of the different age distribution alone. Standardization makes the two populations look similar in regards to age distribution. This makes it possible to know that a difference in rates, if it exists, is not the result of differences in age distribution.

To accomplish this, a "standard" population is chosen. The standard population used in this report is the US Census 2000 population. For each age group in the standard population, a proportion of the total population is calculated. For example, the 0-4 age group comprises 0.069136 of the total US population in 2000. These proportions are calculated so that the sum of proportions equals one. For each age group, the age group proportion is multiplied times the age-specific rate of the population of interest. Basically, this proportion is used to "weight" the age-specific rate calculated for the population of interest. Once the age-specific rates are "weighted", all weighted age-specific rates are summed and the result is the age-adjusted or standardized rate. Standardized rates can be compared to each other as long as the same standard population is used for each calculation.

More generally, the calculation is as follows:

$$R'' = \sum w_i R_i = \text{standardized rate (per 10,000)}$$

where

$$w_i = \text{i}^{\text{th}} \text{ age specific population proportion in the standard population such that } \sum (w_i) = 1.0$$

R_i = age-specific rate (per 10,000) for the i^{th} age group.

D_i = total number of events for the i^{th} age group upon which age-specific rate is based.

* Chalsma, A, Reichel, D, Taylor, C, *Leading causes of Death of New Hampshire Residents, 1999-2001*; Concord, NH: New Hampshire Department of Health and Human Services, Division of Public Health Services, Health Statistics and Data Management Section, 2005.

CONFIDENCE INTERVAL CALCULATIONS FOR RATES

To allow comparison of statistics, whenever possible, confidence intervals were calculated at the 95% level and presented in the charts and graphs. The methods used were based on those used by the National Center for Health Statistics at the Centers for Disease Control and Prevention in their reports on death.

While we have exact counts of hospital discharges, emergency department visits, and deaths due to asthma in New Hampshire (no uncertainty and no need for confidence intervals) we expect that with a given level of risk in a population, the number of deaths, hospital discharges, and emergency department visits will vary from year to year. When comparing populations, we use the observed rate to give us information about the underlying risk of death, hospitalization and visit to the emergency department. Confidence intervals are a good way to represent the degree of uncertainty we have about this underlying risk.

A good example of this concept is the experiment of flipping coins. Flipping a coin one hundred times and getting 48 heads is like having a population of 100 individuals and having 48 hospitalizations. The “risk” of getting heads may be 0.48 or it might be 0.50 or perhaps 0.64. We don’t know for sure. Some coins are not “fair” and it cannot be automatically assumed that the probability of getting a heads is exactly 0.50, to fit a preconceived opinion, or that the probability is exactly 0.48 because that is the result of one experiment. If we could do this experiment many times, we would expect to have more information about the true probability. If the coin is fair, we expect that we will usually get around 50 heads, but we might not be overly surprised if we sometimes get less than 40 or more than 60 heads. In fact, the 95% confidence interval for this experiment (with a fair coin) is between 40 and 60 heads. In the same way, we consider the number of hospitalizations in a population as a sample of one of many possible outcomes based on an unknown risk of hospitalization. There is more certainty with larger numbers (more “experiments” leading to tighter confidence intervals). With small numbers, there is sufficient uncertainty about the underlying risk of hospitalization so that we don’t report rates involving less than 10 events.

Confidence intervals for age specific rates are calculated in the following way. When the number of events the rate is based on is 100 or greater, the following formula is used:

$$\text{Lower 95\% limit} = R - (1.96 * R / \sqrt{D})$$

$$\text{Upper 95\% limit} = R + (1.96 * R / \sqrt{D})$$

where

R = the rate

D = the number of deaths, hospitalizations, or emergency department visits in the rate.

When the number of events is less than 100, the Poisson distribution is used to estimate the confidence interval:

Lower 95% limit = R * L

Upper 95% limit = R * U

where

R = the rate

L and U = values in a table derived from the Poisson distribution for the 95% level

The confidence interval calculation for **age-adjusted rates** is the same for rates based on fewer than 100 events. When based on more than 100 events a different procedure is used that is more complex.

Lower 95% limit = $R'' - (1.96 * S(R''))$

Upper 95% limit = $R'' + (1.96 * S(R''))$

where

R'' = standardized rate per 10,000

$S(R'') = \sqrt{\sum (w_i^2 R_i^2 / D_i)}$

w_i = i^{th} age specific population proportion in the standard population such that $\sum (w_i) = 1.0$

R_i = age-specific rate (per 10,000) for the i^{th} age group.

D_i = total number of events for the i^{th} age group upon which age-specific rate is based.

CONFIDENCE INTERVAL CALCULATIONS FOR PERCENTS *

Confidence intervals for percents not derived from survey data were calculated at the 95% level using the formulas below and presented in the charts and graphs when possible. The methods used were based on those used by the National Center for Health Statistics at the Centers for Disease Control and Prevention in their reports on death. More complex formulas are used for survey data based on the survey sampling plan.

The following conditions must be met to calculate 95% CI for percents:

$$D * p \geq 5 \text{ and } D * q \geq 5$$

where

$$\begin{aligned} D &= \text{the denominator} \\ p &= \text{percent divided by 100} \\ q &= 1 - p \end{aligned}$$

If the conditions are *not* met, the variation in the percent will be so large as to render the confidence intervals meaningless.

$$\text{Lower 95\% limit} = p - [1.96 * \sqrt{(p * (q/D))}]$$

$$\text{Upper 95\% limit} = p + [1.96 * \sqrt{(p * (q/D))}]$$

where

$$\begin{aligned} D &= \text{the denominator} \\ p &= \text{percent divided by 100} \\ q &= 1 - p \end{aligned}$$

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