

## The Burden of Asthma in North Carolina

Asthma is one of the most prevalent chronic diseases today. Almost 30 million persons in the United States have ever been diagnosed with asthma.<sup>1</sup> In 2005, a need was noted in North Carolina to document the current burden of asthma. This information, which was released in the report, *Burden of Asthma in North Carolina in 2006*, serves two main purposes: 1) to give those who work to reduce the burden of asthma a clear picture of what is going on in North Carolina today, and 2) to provide a baseline from which to evaluate the effectiveness of interventions that will be conducted as part of the State Plan implementation.

The *Burden of Asthma in North Carolina in 2006* (available on the Web at [www.asthma.ncdhhs.gov/ncapBurdenReport.htm](http://www.asthma.ncdhhs.gov/ncapBurdenReport.htm)) examines the current burden of asthma in the state using several different measures, including prevalence, asthma management, quality of life, health care utilization, mortality, and cost of asthma.

### Asthma Prevalence

The asthma prevalence for North Carolina was measured through three surveys, the North Carolina Behavioral Risk Factor Surveillance System (N.C. BRFSS), the Childhood Health Assessment and Monitoring Program (N.C. CHAMP), and the North Carolina Youth Risk Behavior Survey (N.C. YRBS). The N.C. BRFSS is population-based, annual, random telephone survey of residents aged 18 and older in households with telephones.<sup>2</sup> The N.C. CHAMP survey looks at children age 17 and younger, and is conducted as a continuation of the N.C. BRFSS. The children who are selected for the N.C. CHAMP are chosen through a child selection module conducted during the N.C. BRFSS. The N.C. YRBS is a school-based survey conducted by state and local education and health agencies in middle and high schools.<sup>3</sup>

Asthma prevalence is a measure of the number of persons in the population affected by asthma at a certain time.<sup>4</sup> Asthma is a difficult disease to quantify in a population, because asthma may appear to resolve itself over time. Although persons who are diagnosed with asthma have the

possibility of being symptom-free for long periods of time, once a person is diagnosed with asthma, it is with them for the rest of their lives.<sup>5</sup> Therefore, we look at the prevalence of asthma in primarily in two ways, lifetime asthma prevalence and current asthma prevalence.

Lifetime asthma prevalence is defined as an affirmative answer to the question “Have you ever been told by a doctor, nurse, or other health professional that you have asthma?” Current asthma is defined as an affirmative response to the lifetime asthma prevalence question, as well as an affirmative response to the subsequent question “Do you still have asthma?”<sup>6</sup>

### Asthma Prevalence Key Findings

#### Adults

- In 2005, approximately 651,114 adults (age ≥18 years) (10.1% of the population) in North Carolina reported ever having been told by a health care provider that they have asthma. Of those adults in North Carolina, 418,040 (6.5%) reported currently having asthma.<sup>7</sup>
- Adult females in North Carolina are 1.4<sup>a</sup> times more likely than adult males to have lifetime asthma, and are 1.79<sup>b</sup> times more likely than males to have current asthma.<sup>7</sup>
- North Carolina adults living in households with an income less than \$15,000 are 1.78 times as likely to have lifetime asthma and are 2.14 times as likely to have current asthma as those who live

<sup>a</sup>Odds Ratio (an approximation of the rate ratios with rare diseases), 95% Confidence Interval (CI) 1.3-1.6

<sup>b</sup>Odds Ratio, 95% CI 1.6-2.1

in households that make more than \$15,000 a year.<sup>7</sup>

## Children

- ▶ In 2005, 311,118 children (age ≤ 17 years) (17.8% of the population) in North Carolina reported ever having been told by a health care provider that they have asthma. Of those children, 200,549 (11.5%) reported that they still currently have asthma.<sup>8</sup>
- ▶ Male children in North Carolina are 1.5<sup>c</sup> times as likely to have lifetime asthma as are female children in N.C.<sup>8</sup>
- ▶ According to the 2004 National Health Interview Survey (NHIS), the national median for lifetime asthma was 12.2% for children. For current asthma, the national median reported in the 2004 NHIS was 8.5% for children. Although 2004 data are not available for North Carolina children, the 2005 data that are available do suggest that North Carolina's childhood lifetime asthma prevalence (17.8%) and current asthma prevalence (11.5%) greatly exceed the national median.<sup>8,9</sup>

## Asthma Management and Quality of Life

The goal of effective management of asthma is to allow children and adults with asthma to function with minimal restrictions and enjoy a good quality of life throughout their lives. There are several ways to monitor and support management and self-management of asthma. These

include: determining the frequency of episodes of the asthma over time; staging the condition according to daytime and nighttime symptoms and lung function; reporting about quality of health, life and activity limitations by persons and their families; use of school and child care action plans to assist children and students with asthma management; and partnering to reduce environmental triggers in the home, child care facilities, school, work and other settings.<sup>10</sup>

Data to measure asthma management and quality of life in North Carolina was obtained from several sources, including the N.C. BRFSS, the N.C. YRBS, and the N.C. CHAMP, as well as the N.C. School Health Education Profile: Princiis Survey, and the National Survey on Children's Health.

- ▶ Almost 50% of North Carolina adults with current asthma reported experiencing asthma symptoms a minimum of once a week over the past 30 days.<sup>7</sup> Approximately 20% of those who reported having symptoms a minimum of once a week, reported experiencing asthma symptoms every day during those 30 days.<sup>7</sup>

## Asthma Attack or Episode

- ▶ Approximately 50% of North Carolina adults with current asthma experienced an asthma attack or episode in the past 12 months.<sup>7</sup>
  - ▶ High school females in North Carolina have a higher prevalence of asthma attack (39.5%) than North Carolina high school males (22.6%).<sup>11</sup>
  - ▶ In 2003, half of children with current asthma in North Carolina reportedly had an asthma attack or episode in the previous 12 months.<sup>12</sup>



## Missed Activity

- ▶ Thirty-two percent of adults in North Carolina with asthma were unable to work or carry out normal activity due to their asthma at least one day during the last 12 months.<sup>7</sup>

<sup>c</sup>Odds Ratio, 95% CI 1.3-1.8

- Children with asthma are 37 times more likely to miss school than children without asthma symptoms.<sup>13</sup>
- Of the children in North Carolina with current asthma, almost half (47.5%) missed at least one day of school due to their asthma in the last year. Of that group, 37% of children with asthma missed between one and nine days of school in the past 12 months due to their asthma, and 10% of children with asthma missed 10 or more days due to their asthma.<sup>8</sup>

## Health Care Utilization

Asthma health care utilization data includes information on hospitalization and emergency room visits, as well as routine checkups and medication usage which are not shown in this plan but are documented in detail in the *Burden of Asthma in North Carolina 2006* report. This data is currently obtained from three primary sources, the N.C. BRFSS, the N.C. CHAMP, and the State Center for Health Statistics hospital discharge database. The hospital discharge database consists of patient-level information drawn from the billing database on diagnoses, date of admittance and date of discharge, length of stay, information on the patient such as county of residence and gender, patient status at discharge, payer, and total amount billed for the hospital stay. Please note, several types of hospitals are not included in this database, such as military and veteran hospitals, ambulatories, specialty hospitals, rehabilitation facilities, psychiatric facilities and prison hospitals.

Hospitalizations due to asthma often result from uncontrolled asthma. These serious episodes of asthma can generally be prevented with proper treatment and management of the disease. Therefore, hospitalizations due to asthma can be avoided with good asthma management techniques, ongoing education, and support for patients.

- In 2004, females in North Carolina had a significantly higher asthma hospitalization rate (158 per 100,000) than males (92.8 per 100,000).
- In 2004, the highest asthma hospitalization rates in North Carolina occurred in the youngest age group, ages 0-4 years (312.7 per 100,000). The rates then

steadily decreased through middle age and then began increasing again in the 65+ age group to a rate of 210.2 per 100,000.

- In 2004, total charges for hospitalizations in North Carolina for a primary diagnosis of asthma exceeded \$88 million. This represented an average charge of \$8,259 per asthma hospitalization stay.
- A visit to the emergency department because of one's asthma is often an indication of inadequate long-term management of asthma and/or inadequate plans for management of exacerbations.<sup>14</sup>
- Almost a quarter (23.6%) of adults with current asthma in North Carolina visited an ER or urgent care center in the 12 months before being surveyed. Of that 23.6%, two-thirds went three or more times.
- Almost 25% of children with current asthma in North Carolina visited the hospital emergency room or urgent care clinic because of their asthma in the 12 months before being surveyed. In North Carolina, African American children were more than twice as likely as white children to have visited the hospital emergency room or urgent care clinic because of their asthma.<sup>8</sup>

## Mortality

Deaths due to asthma, while not common, are preventable and represent a breakdown in successful disease management. The national data from 2002 show that 4,261 persons died in the United States that year from a primary cause of asthma, while 110 people in North Carolina died from a primary cause of asthma in that same year.

The most recent data from North Carolina shows that in 2005, 116 people died due to a primary cause of asthma. North Carolina mortality data was obtained from the Detailed Mortality Report that is published by the North Carolina State Center for Health Statistics each year.

- Since 1995, the number of deaths due to a primary cause of asthma has decreased from 180 (a rate of 20.81 deaths per million population) to 116 deaths in 2005 (a rate of 13.57 deaths per million population).
- In North Carolina in 2005, females had a significantly higher mortality rate (17.48 per 1,000,000) due to a primary cause of asthma than males (8.24 per 1,000,000). This data is consistent with previous years.
- Over the previous 6 years (1999-2005), African Americans' mortality rate due to asthma (30.39 deaths per million) was significantly higher than the mortality rate due to asthma for whites (11.21 deaths per million).<sup>6</sup>

## Healthy People 2010

Healthy People 2010 presents a comprehensive, nationwide health promotion and disease prevention agenda intended to serve as a roadmap for improving the health of all people in the United States during the first decade of the 21st century. Healthy People 2010 is designed to achieve two overarching goals: 1) increase quality and years of healthy life, and 2) eliminate health disparities. These two goals are supported by specific objectives in 28 focus areas. Each objective was developed with a target to be achieved by the year 2010, including objectives focusing on asthma.<sup>15</sup>

Asthma is addressed in the Healthy People 2010 document in section 24, *Respiratory Disease*. There are eight objectives directly related to addressing asthma as a public health problem. These are presented in the following tables, which also show where North Carolina currently stands in meeting each of these goals.

### Healthy People 2010: Asthma Mortality

When looking at the entire population of North Carolina in 2005, we appear to be currently reaching the Healthy People 2010 target only in the age group of 65+.

Table 1. Rates (per 1,000,000) of Mortality Due to Asthma versus Healthy People 2010 Goal, North Carolina, 2005

| All          | Healthy People 2010 Goal Rate (per 1,000,000) | North Carolina 2005 Rate (per 1,000,000) |
|--------------|---|--|
| Age 0 to 4   | 1.0   | 3.4                                      |
| Age 5 to 14  | 1.0   | 6.8                                      |
| Age 15 to 34 | 2.0   | 3.7                                      |
| Age 35 to 64 | 9.0   | 12.2                                     |
| Age 65+      | 60.0  | 53.2                                     |

Data Source: North Carolina State Center for Health Statistics: Detailed Mortality Statistics, 2005

However, when we examine the data by sex and race, a different picture is seen. In the following table, deaths from the years 1999 through 2005 were combined because of the small number of deaths that occur every year in each sex and racial group.

Table 2. Mortality Due to a Primary Cause of Asthma per 1,000,000 Population versus Healthy People 2010 Goal, by Sex and Race, North Carolina, 1999-2005<sup>1,2</sup>

|              | Healthy People 2010 Goal Rate (per 1,000,000) | White Males | White Females | Minority Males | Minority Females |
|--------------|---|-------------|---------------|----------------|------------------|
| Age 0 to 4   | 1.0   | *           | *             | *              | *                |
| Age 5 to 14  | 1.0   | *           | *             | 7.08           | 7.26             |
| Age 15 to 34 | 2.0   | 2.52        | 2.96          | 8.85           | 8.46             |
| Age 35 to 64 | 9.0   | 4.85        | 12.56         | 24.9           | 37.7             |
| Age 65+      | 60.0  | 32.85       | 69.23         | 103.17         | 98.6             |

\* <5 but >0 deaths

<sup>1</sup> Asthma death defined as primary cause of death as asthma (ICD-10 J45-J46)

<sup>2</sup> Minority includes African American, Asian, and American Indian and Alaskan Native

Data Source: North Carolina State Center for Health Statistics: Detailed Mortality Statistics, 2005

When the mortality rates for North Carolinians are examined by sex and race, significant disparities in asthma mortality are seen. Although none of these groups met all of the Healthy People 2010 goals, white males came the closest with those in the 35 and older category meeting their specific goals in their respective age groups. In the age groups where there were more than five deaths, both white and minority females failed to meet the Healthy People 2010 goals, with minority females faring much worse than white females. Minority males had significantly higher mortality rates in each age group than white males and females, and failed to meet the Healthy People 2010 goal in each represented age group.

Disparities due to sex, age, and race will be discussed in more detail later in this section.

## Healthy People 2010: Asthma Hospitalization

Hospitalizations due to a primary cause of asthma in North Carolina exceeded the Healthy People 2010 goal in each age group.

Table 3. Hospitalizations with a Primary Cause of Asthma per 100,000 Population versus Healthy People 2010 Goal, North Carolina, 2004<sup>1,2,3</sup>

| All         | Healthy People 2010 Goal Rate (per 10,000) | North Carolina 2004 Rate (per 1 0,000) |
|-------------|--|--|
| Age 0 to 4  | 25   | 31.3                                   |
| Age 5 to 64 | 7.7  | 9.8                                    |
| Age 65+     | 11   | 21                                     |

<sup>1</sup> Only includes primary diagnoses of asthma for North Carolina Residents served in North Carolina hospitals

<sup>2</sup> Rates may be smaller than actual asthma-related hospital use for counties that border other states

<sup>3</sup> 2004 data are provisional

Data Source: North Carolina State Center for Health Statistics, 2004

Healthy Carolinians, North Carolina’s 2010 health objectives, set out a comprehensive and ambitious statewide agenda that provides a direction for improving the health and well being of North Carolinians over the next decade. The first of two Healthy Carolinians objectives is to reduce asthma hospitalizations to a target rate of 118 per 100,000, which is an 18% reduction from the 1998 baseline of 143.9 per 100,000 rate.

As of 2004, the rate for persons hospitalized due to asthma was 125.9 per 100,000, which is a 12.5% improvement from the 1998 baseline hospitalization rate.

## Healthy People 2010: Asthma Management and Quality of Life

### Activity Limitation

The N.C. BRFSS asked adults age 18 and older “During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?” The N.C. CHAMP looked at children ages 17 and younger in North Carolina, and asked parents if, “During the past 12 months, how many days of daycare or school did your child miss due to asthma?”

The 2005 N.C. BRFSS results show that 32.5% of adults with current asthma responded that they experienced activity limitations because of their asthma. This is well above the Healthy People 2010 target of 10%. The 2005 N.C. CHAMP showed that, of children with current asthma, 47.5% missed at least one day of school in the last year due to their asthma. Healthy People 2010 does not yet have a target for this, as this objective is currently in the developmental phase.

### Patient Education

North Carolina data related to this question are currently available only for those North Carolinians age 17 and younger. N.C. CHAMP asks the question “Has a doctor or other health professional ever given you an asthma management plan for (your child)?”

While this Healthy People 2010 objective is meant to cover a broader scope than just asthma management plans, asthma management plans are used as part of an overall effort to educate patients in self-management.<sup>18</sup> An individualized asthma management plan should include strategies for identifying and controlling asthma triggers; taking medication(s) as recommended by a health care professional as needed or on a daily basis; monitoring and recognizing early objective and subjective signs and symptoms of an acute episode of asthma or of poorly controlled asthma; and providing a plan for what to do in case of an emergency. The plan should also include contact information for the health care provider and even for a local hospital. An asthma management plan helps the patient and his or her health care provider to establish a course of action for managing asthma.<sup>17</sup> Asthma Management Plans are needed for use in schools and child and adult care facilities and should be provided to patients, families, school staff, and other providers who care for the child or adult.

According to the 2005 N.C. CHAMP, 56.9% of children age 17 and younger with current asthma have been given an asthma management plan by a doctor or other health professional.



### Disparities

African Americans, females, the very young, and the very old are all adversely affected by asthma in North Carolina. Females are hospitalized due to asthma more than males, and die from asthma at a significantly greater rate. The very young and the very old are hospitalized due to asthma at a greater rate than other age groups, and the very old die at a much greater rate due to asthma as a primary cause than those who are younger.

Data collected in North Carolina show that African Americans die at a greater rate due to asthma than whites. However, race data is not available for hospitalizations and emergency room visits in North Carolina. National data show that African Americans also visit the emergency room for their asthma at a greater rate than whites. National Hospital Discharge data is available and shows large racial and ethnic disparities. Between 1980 and 1999, national asthma hospitalization rates increased significantly more among black children than among white children. In 1998-1999, the asthma hospitalization rate among black children (569 per 100,000) was 3.6 times the rate for white children (155 per 100,000).<sup>17</sup> According to the National Hospital Discharge Survey, in 2002, the asthma hospitalization rate for all African Americans (360 per 100,000) was 225% higher than the asthma hospitalization rate for all whites (110 per 100,000).<sup>18</sup>

## Cost of Asthma

Asthma is a significant economic burden at national, state and local levels. An economic analysis commissioned by the American Lung Association estimated the 2004 annual cost for asthma increased to \$16.1 billion from the 2001 estimated annual cost of \$14 billion.<sup>19, 20</sup>

The 2004 American Lung Association's national estimate examined both direct and indirect costs of asthma. Direct costs included physician visits, hospital stays, and medications. Of the \$16.1 billion total estimate, approximately \$11.5 billion was attributed to direct costs. Prescription drugs represented the largest single direct medical expenditure at \$5 billion.<sup>21</sup>

Indirect costs included but were not limited to lost work days, school absenteeism, loss of productivity, and lost earnings, all of which were estimated to result in \$4.6 billion of the total asthma cost in 2004. This number represented \$1.5 million in lost school days and \$1.4 million in loss of work.<sup>19</sup> However, the largest single indirect cost of asthma was loss of productivity due to death, which was estimated at \$1.7 billion dollars.<sup>21</sup>

The Agency for Healthcare Research and Quality published *Asthma Care Quality Improvement: A Resource Guide for State Action* in 2006. In this document, the economic burden of asthma (including direct and indirect costs) was estimated for each of the fifty states. For North Carolina in 2003, direct costs were estimated at over \$362 million and indirect costs were estimated at more than \$269 million. The total estimated asthma cost for North Carolina for 2003 exceeded \$631 million.<sup>19</sup>

The North Carolina State Center for Health Statistics provided information on the amount billed for hospitalization due to a primary cause of asthma for the years 2002 through 2004. Table 4 displays the total cost of hospitalizations for a primary diagnosis of asthma for all ages for each year, as well as cost of hospitalization per individual stay and average length of stay for a primary diagnosis of asthma.

Table 4. Total Charges Hospitalization for a Primary Diagnosis of Asthma<sup>1,2</sup>, by Average Charges per Stay and Total Hospital Charges per year, 2002 – 2004<sup>3</sup>

|       | Total Discharges | Avg. Length of Stay (days) | Total Hospital Charges | Average Charges per Stay |
|-------|------------------|----------------------------|------------------------|--------------------------|
| 2002  | 11,280           | 3.4                        | \$74,265,930           | \$6,584                  |
| 2003  | 12,051           | 3.6                        | \$90,415,459           | \$7,503                  |
| 2004* | 10,753           | 3.6                        | \$88,791,995           | \$8,259                  |

<sup>1</sup>ICD-9 diagnostic codes 493.00 through 493.92

<sup>2</sup>Data includes only N.C. residents served in N.C. hospitals. Numbers and rates shown may be smaller than the actual hospital use for counties that border other states.

<sup>3</sup>2004 data provisional

Data Source: North Carolina State Center for Health Statistics, 2002–2004

## Conclusion

The burden of asthma in North Carolina is significant. Almost one million North Carolinians have ever been diagnosed with asthma, and over 600,000 adults and children in North Carolina are currently living and dealing with the disease<sup>2</sup>. Significant sex, race, and age disparities demonstrate that targeted interventions among high-risk populations will be necessary so that the program utilizes its resources to the fullest. The North Carolina Asthma Plan presents a comprehensive approach to addressing issues that face these high-risk populations, as well as issues that face all North Carolinians with asthma and those who relate to these individuals. This plan is a significant step in our quest to reduce the burden of asthma in North Carolina.