The Burden of Asthma in West Virginia

August 2007

WEST VIRGINIA Department of Health & Human Resources

Bureau for Public Health
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Charleston, WV 25301

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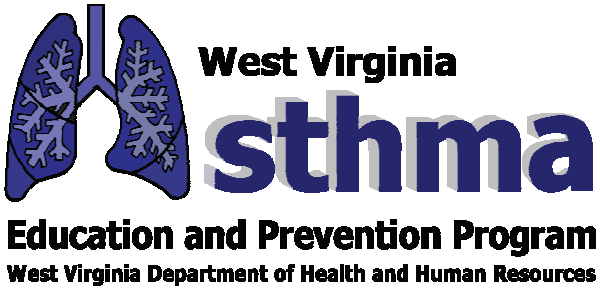

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EXECUTIVE SUMMARY

Asthma is a chronic lung disease characterized by recurrent and intermittent episodes or attacks in which the linings of the airways swell, mucus blocks the airways, and the muscles around the airways tighten. During an episode, people with asthma experience tightness in the chest, difficulty breathing, wheezing, and coughing. Asthma symptoms occur when exposed to certain triggers such as pet dander, mold, dust mites, tobacco smoke, or wood smoke. Asthma symptoms can be controlled through appropriate use of medications and avoidance of identified triggers. However, poor management of the disease can lead to complications that result in poor health, hospitalization, and even death.

The West Virginia Asthma Education and Prevention Program, funded by the Centers for Disease Control and Prevention, is charged with 1) establishing a statewide network of key stakeholders and partners dedicated to addressing asthma; 2) maintaining an asthma surveillance system that identifies priority populations for intervention, directs program activities, and evaluates program effectiveness, and 3) implementing health promotion programs and interventions to reduce the burden of asthma in West Virginia. This report summarizes data from the West Virginia asthma surveillance system. It is an update to *The Burden of Asthma in West Virginia* published in 2003 and is the most comprehensive source of information about asthma in this state. The data presented in this report indicate that there are four populations in West Virginia with a high burden of asthma: 1) children, 2) the elderly, 3) adult women, and 4) West Virginians of low socioeconomic status. Listed below are some of the key findings of this report.

Asthma Prevalence

- Approximately 8.5% of West Virginians currently have asthma. This equals approximately 123,000 adults and 31,000 children.
- The prevalence of asthma is significantly higher among adult females than males. Adults without a high school diploma and with an annual income less than $25,000 are more likely to have asthma than those with higher levels of education and income.
- In four out of the past seven years, the prevalence of adult asthma was significantly higher in West Virginia than the United States.

Asthma Symptoms & Disease Management

- Approximately 60% of children and 50% of adults had an asthma attack in the past 12 months.
- Nearly one-fourth (24.6%) of adults with asthma had asthma symptoms every day in the past 30 days; 22.0% had difficulty staying asleep because of their asthma on 5 or more days in the in the past 30 days.
- More than one-third (37%) of public high school students with asthma missed school because of their asthma during the 2004-2005 school year. In 2006, 15.6% of adults with asthma were unable to carry out their usual activities because of their asthma on 7 or more days in the 12 months prior to the survey.
- Children and adults with asthma are significantly more likely to have fair or poor health than those without asthma.

Health Care Access & Utilization

- In 2003, 4.0% of children with asthma stayed overnight in the hospital due to their asthma in the past 12 months. Children with asthma were significantly more likely than those without asthma to have had a sick visit or emergency room visit in the past 12 months.
- In the past 12 months, 56.2% of adults with asthma visited a doctor for a routine asthma checkup, 24.9% visited a doctor for treatment of urgent or worsening asthma symptoms, and 19.4% visited an emergency room because of their asthma.
- Between 1996 and 2005, there was an average of nearly 2,600 hospitalizations with a primary diagnosis of asthma each year.
- In 2005, the asthma hospitalization rate was more than two times higher among females than males. The rate of asthma hospitalizations was highest among children under the age of 15 in the years 1996-2002 and among adults aged 65 and older in the years 2003-2005. Between 1996 and 2005, the rate of asthma hospitalizations more than doubled among adults aged 65 and older.
- Total charges for asthma hospitalizations increased from $10.3 million in 1996 to $23.2 million in 2006.

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INTRODUCTION

Asthma Defined

Asthma is a chronic lung disease. People with asthma have overly sensitive airways that become inflamed when exposed to certain triggers (1,2,3). Exposure to triggers causes recurrent and intermittent episodes or attacks in which the linings of the airways swell, mucus blocks the airways, and the muscles around the airways tighten. During an episode, people with asthma experience tightness in the chest, difficulty breathing, wheezing, and coughing.

Experts do not know how to cure asthma, but they do agree that asthma symptoms can be adequately controlled through appropriate use of medication and avoidance of identified triggers. With proper asthma management, people with asthma can lead healthy and active lives. However, poor management of the disease can lead to complications resulting in illness, hospitalization, and even death.

Common Asthma Triggers

- Allergens such as dust mites, pet dander, pollen, mold, and cockroaches
- Irritants such as tobacco and wood smoke, outdoor air pollution, and strong odors
- Exercise
- Adverse weather such as cold air and high humidity
- Strong emotions such as anxiety, fear, and excitement
- Respiratory infections

Asthma in the United States

During the 1980s and 1990s, asthma prevalence, morbidity, and mortality increased substantially in the United States (4). During this time, the prevalence of asthma increased 74%, the rate of asthma-related emergency room visits increased 27.5%, and the asthma mortality rate increased more than 50% (4). In recent years, asthma prevalence has stabilized and hospitalizations and mortality have decreased (5,6,7). However, the burden of asthma remains high, given that it is a manageable disease.

In 2004, more than 20.5 million Americans had asthma (8). Asthma differs from most other chronic diseases and health conditions because it affects people of all ages. In fact, nearly 6.2 million Americans under the age of 18 had asthma in 2004 (8), making it one of the most common chronic conditions among children (6). Many asthma-related hospitalizations and deaths are considered preventable. Nevertheless, it is estimated that health care and lost productivity due to asthma cost the United States $16.1 billion in 2004 (9).

Although the overall burden of asthma has improved, demographic, socioeconomic, and regional disparities in asthma prevalence, morbidity, and mortality still exist (5,8). For example, the prevalence of asthma is higher among children than adults and blacks than whites. Asthma hospitalizations are highest among children under the age of 15 but are increasing rapidly among the elderly. Blacks are more than three times more likely than whites to be hospitalized due to asthma and more than two times more likely to die from asthma.

U.S. Asthma Statistics In 2004...

- 8.5% of children and 6.7% of adults had asthma (8).
- Asthma prevalence significantly differed by socioeconomic status; 9.9% of the poorest Americans had asthma, compared with 6.6% of the wealthiest Americans.*
- 57% of Americans with asthma had an asthma attack. Females had a significantly higher asthma attack prevalence than males (44.3 per 1,000 versus 36.7 per 1,000) (5).
- Asthma accounted for 14 million lost school days among children (6) and 14.5 million lost work days among adults (7).
- Asthma accounted for 1.8 million emergency room visits (5), 497,000 hospitalizations (5), and 3,780 deaths (10).
- Asthma cost the United States $11.5 billion in direct health care costs and $4.6 billion in productivity loss due to morbidity and mortality (9).

** Based on ratio of family income to poverty threshold. Poorest = ≤0.99, Wealthiest = ≥4.50.*

INTRODUCTION

Addressing the Burden of Asthma

Asthma has been identified as a public health priority. Many organizations and governmental agencies, such as the American Academy of Allergy Asthma and Immunology, the American Lung Association, the Asthma and Allergy Foundation of America, and the Environmental Protection Agency are addressing the burden of asthma in the United States.

The National Asthma Education and Prevention Program (NAEPP) was initiated in 1989 by the National Heart Lung and Blood Institute (NHLBI) (11). One of NAEPP's major achievements has been the development and distribution of clinical guidelines for asthma care for health care professionals. The 1997 *Guidelines for the Diagnosis and Management of Asthma* (12) and the 2002 *Update on Selected Topics* outline the standards of optimal asthma care based on reviews of scientific literature (12,13).

The Centers for Disease Control and Prevention (CDC) is also addressing asthma. *Healthy People 2010*, the nation's health promotion and disease prevention agenda, includes national objectives for improving asthma morbidity and mortality indicators and reducing asthma disparities (14). In 1999, CDC created the National Asthma Control Program (NACP) to support the asthma goals and objectives of *Healthy People 2010* (15). NACP funds programs to enhance asthma surveillance, interventions, and partnerships across the country.

West Virginia Asthma Education and Prevention Program

The West Virginia Asthma Education and Prevention Program (WV-AEPP) is dedicated to reducing the health and economic consequences attributed to asthma in West Virginia. Since 2001, WV-AEPP has been funded by CDC as part of the National Asthma Control Program. WV-AEPP is located within the West Virginia Department of Health and Human Resources, Bureau for Public Health, Office of Epidemiology and Health Promotion, Division of Health Promotion and Chronic Disease.

WV-AEPP

The mission of WV-AEPP is to develop, implement, and evaluate a statewide strategic asthma plan in the ultimate interest of reducing the health and economic consequences attributed to asthma in West Virginia.

WV-AEPP aspires to highlight asthma as a priority health concern and to reduce suffering, disability, death, and economic costs related to asthma.

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WV-AEPP has received funding from CDC for six years. The first three years of funding (2001-2004) were dedicated to building partnerships and developing a plan for addressing asthma in West Virginia. WV-AEPP worked with several key partners to form the West Virginia Asthma Coalition (WVAC), an organization with a diverse membership of health care professionals, researchers, nonprofit organizations, and government agencies interested in asthma issues. Together, WV-AEPP and WVAC produced *The Burden of Asthma in West Virginia* report and *A Strategic Plan for Addressing Asthma in West Virginia*. The burden report defines the scope of asthma in West Virginia and identifies groups disproportionately affected by the disease. The strategic plan outlines goals, objectives, and activities aimed at reducing the burden of asthma in this state.

During the second three years of funding (2004-2007), WV-AEPP and WVAC began implementing activities outlined in the strategic plan. Asthma interventions have been implemented in selected community health centers and elementary schools across the state. WVAC has been successful in developing a law that enables students to carry and self-administer their asthma inhalers at school and supporting a policy that restricts school bus idling.

In the upcoming two-year funding cycle (September 2007 - August 2009), WV-AEPP aims to maintain, expand, and strengthen: 1) the state asthma surveillance system, 2) partnerships to enhance the implementation of the strategic plan, and 3) interventions in community health centers and emergency rooms to improve the care and management of asthma. CDC's National Asthma Control Program has developed as a priority the reduction of asthma hospitalizations in the United States. Therefore, in the next two years, WV-AEPP activities will focus on reducing asthma hospitalizations in West Virginia.

INTRODUCTION

Asthma Surveillance in West Virginia

Public health surveillance is the "ongoing, systematic collection, analysis, interpretation, and dissemination of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know" (16). WV-AEPP has four main goals related to asthma surveillance in West Virginia:

- Annually collect data on asthma prevalence, symptoms, disease management, health care access and utilization, and mortality.
- Analyze and interpret asthma surveillance data in ways that will identify priority populations, direct program activities, and evaluate program effectiveness.
- Disseminate results to key targeted groups in a timely manner in newsletters, fact sheets, statistical briefs, and surveillance reports.
- Identify gaps in the asthma surveillance system and obtain or develop new data sources to fill these gaps.

The West Virginia asthma surveillance system includes data from multiple sources, including the Behavioral Risk Factor Surveillance System, the Youth Tobacco Survey, the Hospital Discharge Database, and the West Virginia Vital Statistics System (see Appendix A for a description of all asthma data sources). Since its creation, the surveillance system has expanded to include new data on childhood asthma, asthma symptoms, and disease management. In addition, the collection of multiple years of data has enabled us to analyze asthma trends and calculate regional asthma prevalence estimates.

This Report

This report summarizes data from the West Virginia asthma surveillance system. It is an update to *The Burden of Asthma in West Virginia* published in 2003 and is the most comprehensive source of information about asthma in this state. The purpose of this report is to:

- Describe the types of data that comprise the West Virginia asthma surveillance system.
- Present results that identify high risk asthma populations to be targeted for health promotion program intervention.
- Identify areas in which additional data are needed to better understand asthma in West Virginia.

The main body of this report contains figures that present percentages, rates, and 95% confidence intervals calculated from multiple data sources. Please refer to the Appendices of this report for detailed tables of the data presented in the figures, additional information about the data sources, and a discussion of the methodologies used during analysis and interpretation.

This report will be used by the West Virginia Asthma Education and Prevention Program and the West Virginia Asthma Coalition to guide asthma-related activities in the upcoming years.

Ultimately, it is our hope that this report will increase awareness of the health and economic burdens of asthma in West Virginia. The West Virginia public, health professionals, and political leaders should know that asthma is a manageable disease and that much of the morbidity, mortality, and economic burden of asthma described in this report are preventable and can be reduced.

1. ASTHMA PREVALENCE

Prevalence Defined

Prevalence is the proportion or percentage of a population with a particular characteristic at a given time. The prevalence of a chronic disease, such as asthma, is an indicator of the extent and distribution of the disease. Asthma prevalence indicators can answer three important surveillance questions:

- How many people have asthma?
- Who has asthma?
- Does the prevalence of asthma differ across the state?

Asthma Prevalence Data

Asthma, like other chronic diseases, must be diagnosed by a health professional. The only way to know the true prevalence of asthma in West Virginia is to clinically examine all residents. This task would be incredibly expensive and time intensive. Surveys that are designed with scientifically based questions and sampling methodologies enable researchers to reliably estimate the prevalence of virtually any characteristic of a population in a much more efficient manner. In West Virginia, the prevalence of asthma is estimated from telephone surveys of randomly selected West Virginia residents.

Since 2000, West Virginia adult asthma prevalence has been measured by the Behavioral Risk Factor Surveillance System (BRFSS). Asthma among West Virginia children and adolescents has been measured by three different surveys: the 2002 and 2005 West Virginia Youth Tobacco Survey (YTS); the 2003 National Survey of Children's Health (NSCH); and the 2005 and 2006 BRFSS. The 2007 BRFSS and the 2007 YTS also include questions about childhood asthma prevalence. See Appendix A for a discussion of the methodologies and limitations of these surveys and Appendix B for a list of the asthma-related questions included in each survey.

In West Virginia, we know more about the prevalence of asthma among adults than children. Adult asthma prevalence data have been collected in a standard format since 2000, enabling us to examine trends in asthma prevalence and produce reliable county/regional estimates of the disease. In contrast, child asthma prevalence data have been collected intermittently and by multiple surveys, making it difficult to draw conclusions about asthma among West Virginia children.

Asthma Definitions

Asthma is a variable disease. Symptoms of the disease differ among individuals, can vary within an individual by time of day and year, and can change throughout the life span. This creates challenges when trying to diagnose and measure asthma. Therefore, two definitions of asthma are used to better understand the scope of the disease:

- Lifetime Asthma: Individuals who have ever been diagnosed with asthma.
- Current Asthma: Individuals who have ever been diagnosed with asthma and currently have asthma.

This Chapter

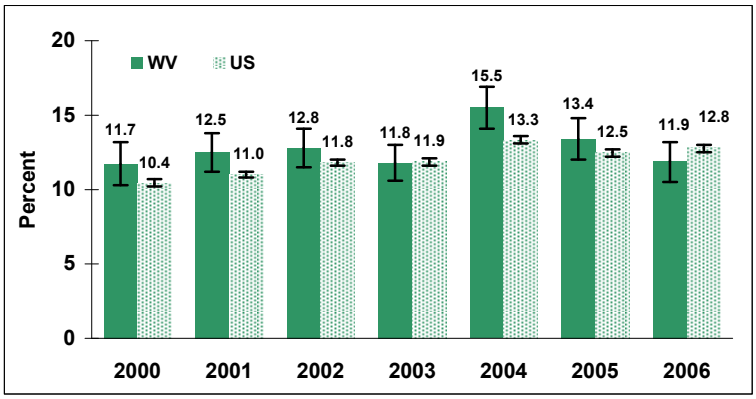
This chapter presents asthma prevalence data for West Virginia adults and children by demographic characteristics known to be associated with the disease (i.e., gender, age, race, and socioeconomic status). The following figures include prevalence estimates and 95% confidence intervals. Refer to Appendix C for a discussion of the methodologies used during analysis and interpretation.

1. ASTHMA PREVALENCE

KEY FINDINGS - ADULTS

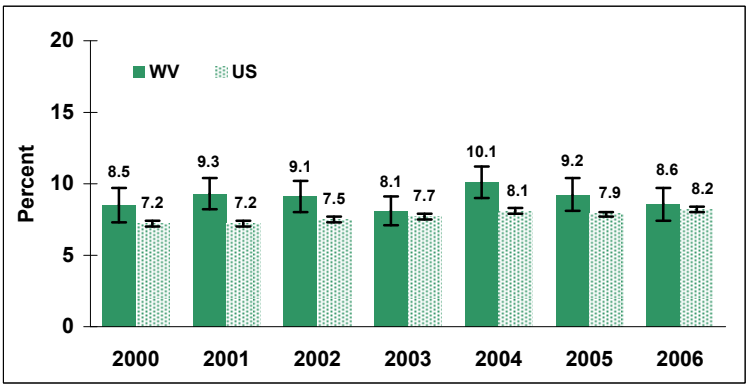
- *In 2006, more than 170,000 (11.9%) West Virginia adults had ever been diagnosed with asthma and nearly 123,000 (8.6%) adults currently had asthma.*
- *West Virginia had a significantly higher prevalence of current asthma than the United States in the years 2001, 2002, 2004, and 2005.*
- *In West Virginia, the prevalence of lifetime asthma significantly declined from 15.5% in 2004 to 11.9% in 2006, whereas the prevalence of current asthma remained relatively stable. Between 2000 and 2006, the prevalence of lifetime and current asthma significantly increased in the United States.*
- *Between 2000 and 2006, West Virginia had a higher prevalence of current asthma than most other states. In four out of those seven years, West Virginia's rate of current asthma was one of the top five highest in the nation.*

Figure 1.1
Adult Lifetime Asthma



Data Source: Behavioral Risk Factor Surveillance System.
Population: Adults age 18 and older.
Lifetime Asthma = Responding "yes" to "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"
Note: US estimates exclude territories.

Figure 1.2
Adult Current Asthma



Data Source: Behavioral Risk Factor Surveillance System.
Population: Adults age 18 and older.
Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Note: US estimates exclude territories.

West Virginia Adult Asthma Rankings*

	Current	Lifetime
2000	5	8
2001	3	5
2002	3	11
2003	16	21
2004	2	2
2005	8	15
2006	22	39

* The rank of West Virginia's prevalence among the 50 states and DC. 2004 ranking excludes Hawaii.

1. ASTHMA PREVALENCE

Figure 1.3
Adult Current Asthma by Gender

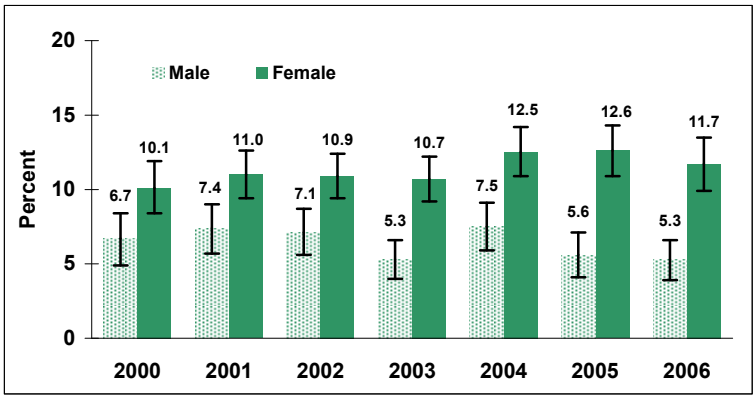


Figure 1.4
Adult Current Asthma by Age

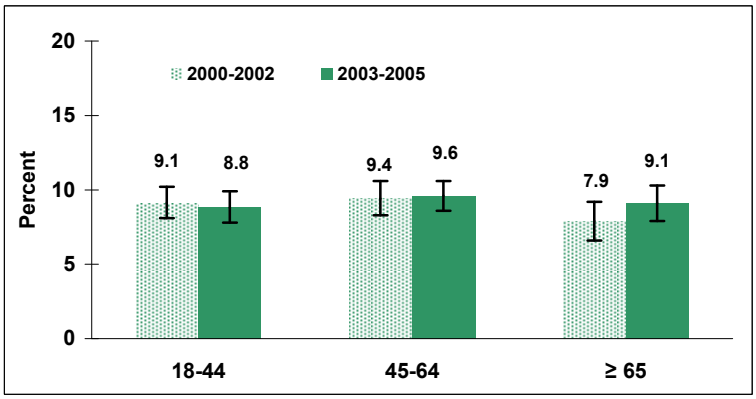
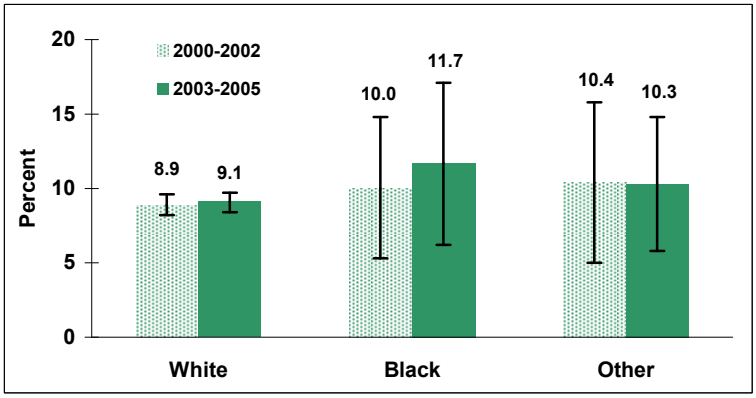


Figure 1.5
Adult Current Asthma by Race



Note: Due to the low number of non-white respondents in the BRFSS, estimates for non-whites are less reliable than those for whites (as represented by the wide 95% confidence intervals).

Figures 1.3, 1.4, 1.5:
Data Source: Behavioral Risk Factor Surveillance System.
Population: West Virginians age 18 and older.
Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

KEY FINDINGS - ADULTS

- *Adult females are significantly more likely to have asthma than adult males.*
- *The gender difference in the prevalence of asthma has increased over the last few years. In 2000, there was no significant gender difference in the prevalence of asthma. By 2006, asthma was more than two times more prevalent among adult females than males.*
- *The prevalence of current asthma does not significantly differ by age or race.*
- *Nearly half (48.8%, 95% CI: 42.3-55.3) of adults who have ever been diagnosed with asthma were first diagnosed during childhood (at age 17 or younger) (BRFSS 2006).*

1. ASTHMA PREVALENCE

KEY FINDINGS - ADULTS

Socioeconomic status (SES) is an indicator of economic and social position. SES has been found to be associated with access to care, health behaviors, and chronic disease. SES is commonly measured with indicators of education, income, and occupation.

- *West Virginia adults without a high school diploma were significantly more likely to have asthma than adults with higher levels of educational attainment.*
- *The prevalence of current asthma significantly decreased as income increased. In 2003-2005, the prevalence of asthma was 2.5 times higher among adults with an annual household income less than $25,000 than those with an income of $50,000 or more.*
- *Adults with low SES (i.e., those without a high school diploma and with an annual household income less than $25,000) are significantly more likely to have asthma than adults with higher levels of education and income.*

Figure 1.6
Adult Current Asthma by Educational Attainment

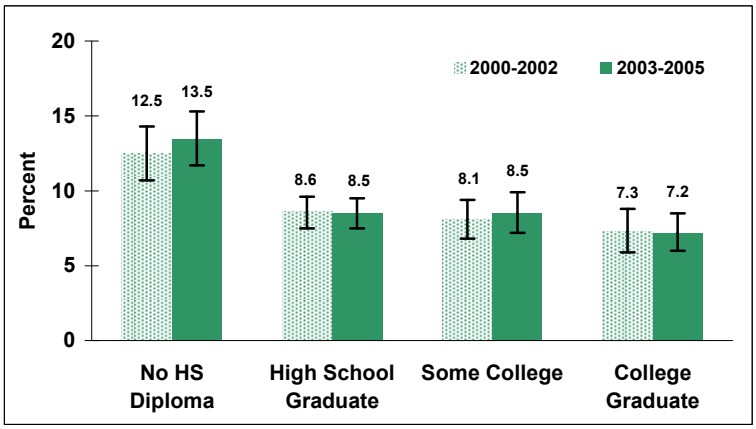


Figure 1.7
Adult Current Asthma by Annual Household Income

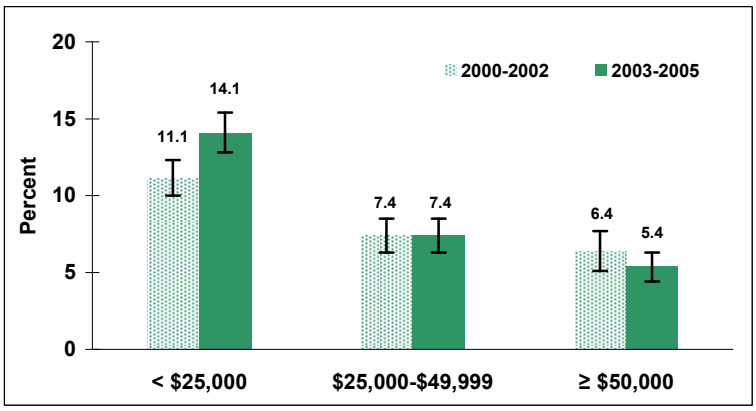
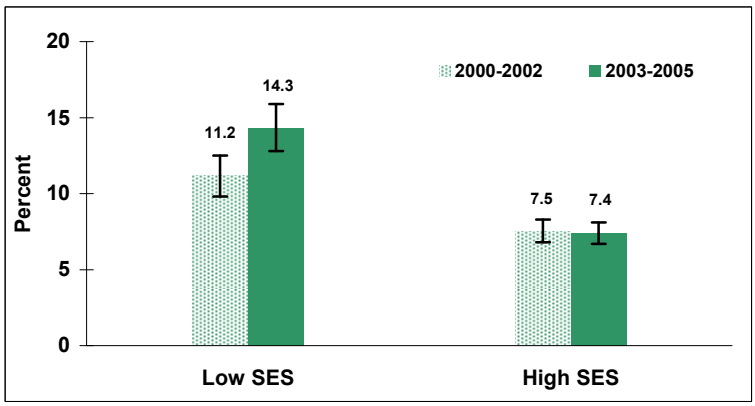


Figure 1.8
Adult Current Asthma by Socioeconomic Status

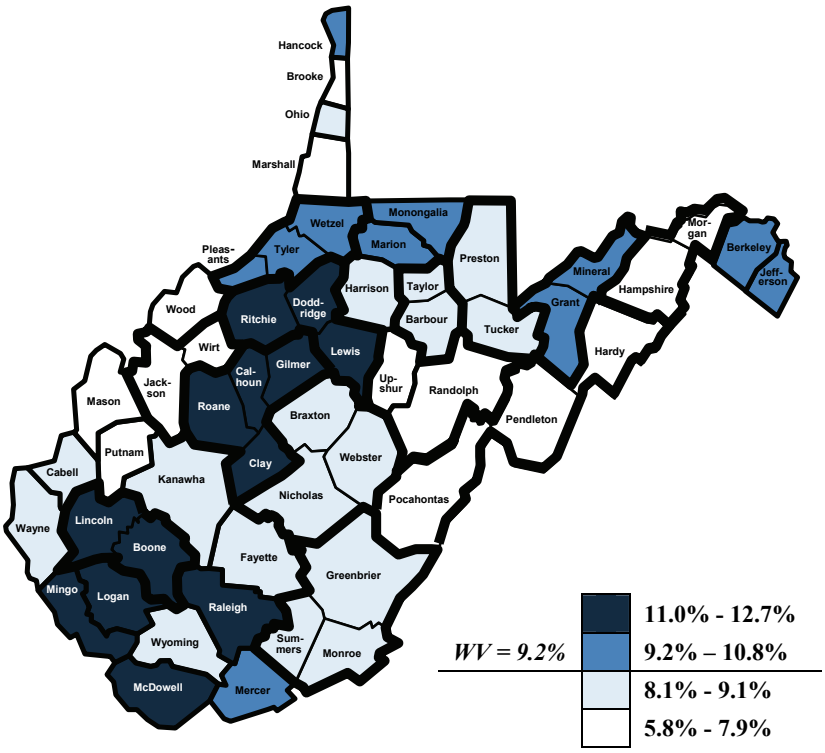


Low SES = Fewer than 12 years of education and a household income <$25,000.
High SES = 12 or more years of education and a household income ≥$25,000.

Figures 1.6, 1.7, 1.8:
Data Source: Behavioral Risk Factor Surveillance System.
Population: West Virginians age 18 and older.
Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

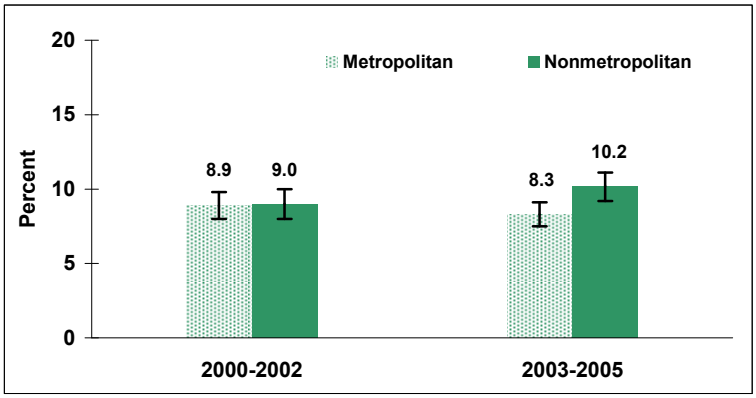
1. ASTHMA PREVALENCE

Figure 1.9
Adult Current Asthma by County, 2001-2005



Data Source: Behavioral Risk Factor Surveillance System.
Population: West Virginians age 18 and older.
Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Note: Multiple years of data and some counties were combined for analysis. Individual county estimates are not available for all counties.
See Appendix D for county/region prevalence estimates and Appendix C for a discussion of the methodology used to calculate county estimates.

Figure 1.10
Adult Current Asthma by Residence



Data Source: Behavioral Risk Factor Surveillance System.
Population: West Virginians age 18 and older.
Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Metropolitan status based on county classification using the USDA 2003 Rural-Urban Continuum codes. See Appendix C for a detailed list of the Rural-Urban Continuum codes and a map of West Virginia county metropolitan status.

KEY FINDINGS - ADULTS

Identifying regional variations in the prevalence of asthma can help identify counties or regions for health promotion intervention.

- *In the period 2001-2005, 9.2% of West Virginia adults had asthma. West Virginia had a significantly higher prevalence of asthma than the United States. (U.S. 2003=7.7%)*
- *The prevalence of asthma among adults ranged from a low of 5.8% in the Hampshire/Morgan region to a high of 12.7% in McDowell County, Mingo County, and the Calhoun/Clay/Gilmer/Roane region.*
- *The Hampshire/Morgan region had a significantly lower prevalence of asthma than West Virginia (5.8% vs. 9.2%). No counties had a significantly higher prevalence of asthma than West Virginia.*
- *The following counties/regions had a significantly higher prevalence of asthma than the United States (U.S. 2003=7.7%): McDowell, Mingo, Raleigh, Boone/Lincoln, and Calhoun/Clay/Gilmer/Roane.*
- *In 2003-2005, the prevalence of asthma was significantly higher in nonmetropolitan counties than in metropolitan counties in West Virginia.*

1. ASTHMA PREVALENCE

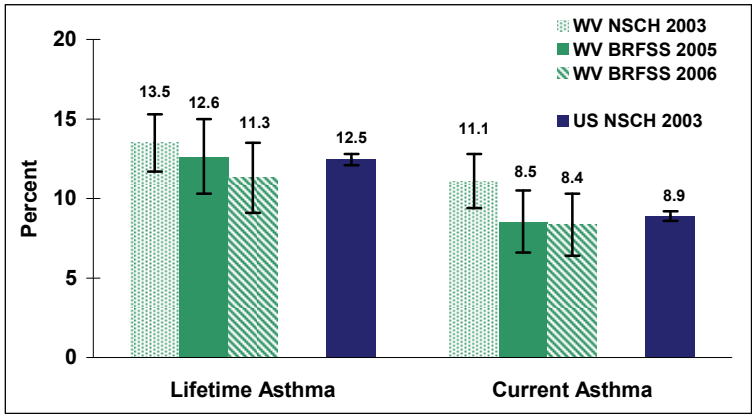
KEY FINDINGS - CHILDREN

Children (age 17 and younger)

The estimates of childhood asthma from the NSCH and the BRFSS differ slightly, although the differences are not significant.

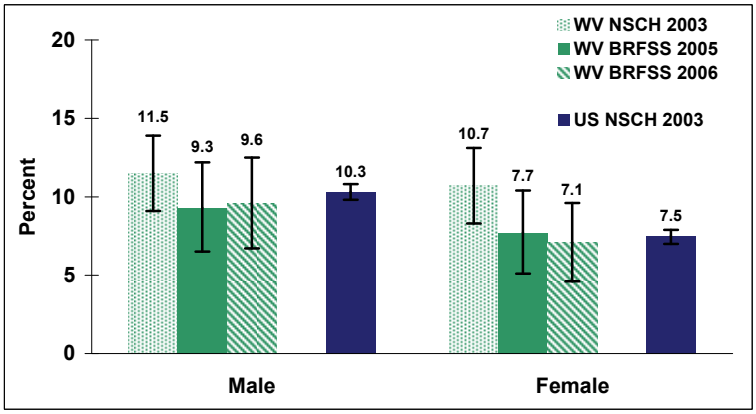
- *Approximately 12% (47,000) of West Virginia children under the age of 18 have ever been diagnosed with asthma.*
- *In 2003, the prevalence of childhood current asthma was significantly higher in West Virginia than the United States. Approximately 11.1% (43,000) of West Virginia children had asthma in 2003, compared with 8.9% of children nationwide.*
- *In 2003, West Virginia had the fourth highest prevalence of current asthma in the nation. Only Delaware (11.9%), Hawaii (11.9%), and the District of Columbia (11.8%) had higher rates of childhood asthma.*
- *In the United States, boys under the age of 17 were significantly more likely to have current asthma than girls in 2003. In West Virginia, boys have a slightly higher rate of current asthma than girls, although the gender difference is not significant.*

Figure 1.11
Child Lifetime and Current Asthma



Data Sources: National Survey of Children's Health, 2003; Behavioral Risk Factor Surveillance System, 2005-2006.
Population: Children age 17 and younger.
NSCH Lifetime Asthma = Responding "yes" to "Has a doctor or health professional ever told you that [child] has…asthma?"
NSCH Current Asthma = Responding "yes" to both "Has a doctor or health professional ever told you that [child] has…asthma?" and "Does [child] still have asthma?"
BRFSS Lifetime Asthma = Responding "yes" to "Has a doctor, nurse, or other medical professional ever said that the child has asthma?"
BRFSS Current Asthma = Responding "yes" to both "Has a doctor, nurse, or medical professional ever said that the child has asthma?" and "Does the child still have asthma?"
Note: Be cautious in comparing NSCH and BRFSS estimates. Results from different surveys may not be directly comparable.

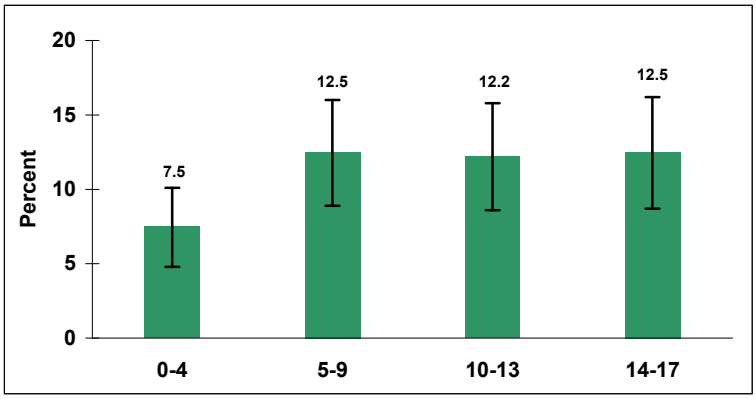
Figure 1.12
Child Current Asthma by Gender



Data Sources: National Survey of Children's Health, 2003; Behavioral Risk Factor Surveillance System, 2005-2006.
Population: Children age 17 and younger.
NSCH Current Asthma = Responding "yes" to both "Has a doctor or health professional ever told you that [child] has…Asthma?" and "Does [child] still have asthma?"
BRFSS Current Asthma = Responding "yes" to both "Has a doctor, nurse, or medical professional ever said that the child has asthma?" and "Does the child still have asthma?"
Note: Be cautious in comparing NSCH and BRFSS estimates. Results from different surveys may not be directly comparable.

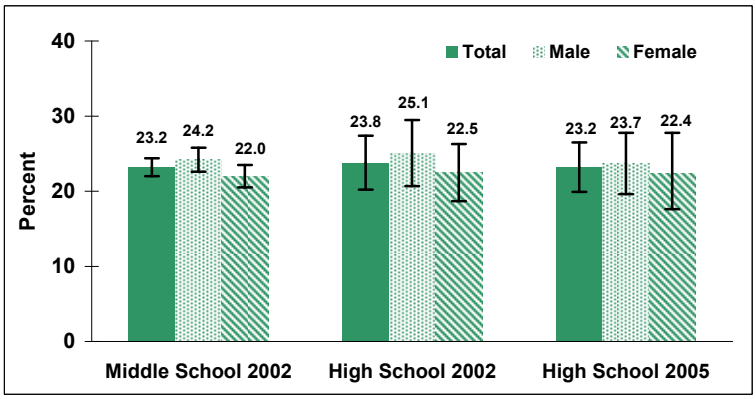
1. ASTHMA PREVALENCE

Figure 1.13
Child Current Asthma by Age, 2003



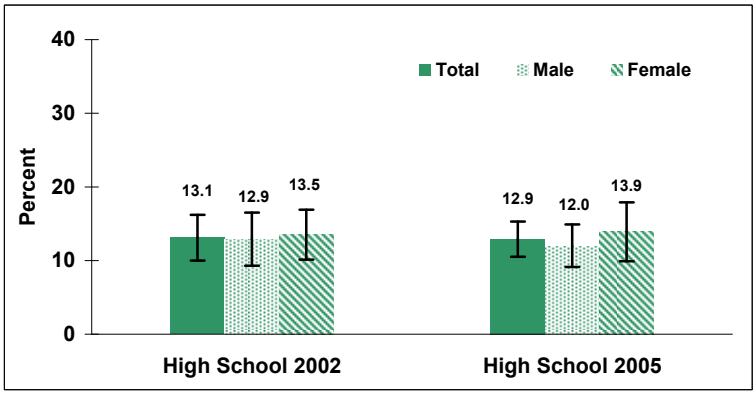
Data Source: National Survey of Children's Health, 2003. Population: Children under 18. Current Asthma = Responding "yes" to both "Has a doctor or health professional ever told you that [child] has…asthma?" and "Does [child] still have asthma?"

Figure 1.14
Youth Lifetime Asthma by Gender



Data Source: West Virginia Youth Tobacco Survey.
Population: West Virginia public middle school and public high school students.
Middle School Lifetime Asthma = Responding "yes" to "Have you ever been told by a doctor that you have asthma?"
High School Lifetime Asthma = Responding "yes" to either "Have you ever been told by a doctor that you have asthma?" or "Have you ever been told by a health care professional that you have asthma?" Middle school students were not surveyed in 2005.

Figure 1.15
Youth Current Asthma by Gender



Data Source: WV Youth Tobacco Survey. Population: WV public high school students. Current Asthma = Responding "yes" to "Have you ever been told by a doctor that you have asthma?" or "Have you ever been told by a health care professional that you have asthma?" and "Do you still have asthma?" Current asthma cannot be calculated for middle school students.

KEY FINDINGS - CHILDREN

- *In 2003, the prevalence of current asthma did not significantly differ by age among children in West Virginia. However, in the United States, children under the age of five were significantly less likely to have asthma than older children.*

Youth
Middle & High School Students

- *According to the West Virginia Youth Tobacco Survey, more than one out of every five public middle school and high school students have ever been diagnosed with asthma. This equals more than 13,000 students in grades 6-8 and more than 17,000 students in grades 9-12.*

- *Approximately 13% (9,300) of West Virginia public high school students currently have asthma. This estimate is comparable to the 2003 NSCH estimate of current asthma among children aged 14-17 (12.5%).*

- *The prevalence of lifetime and current asthma does not significantly differ by gender, age, or grade among public middle school or high school students.*

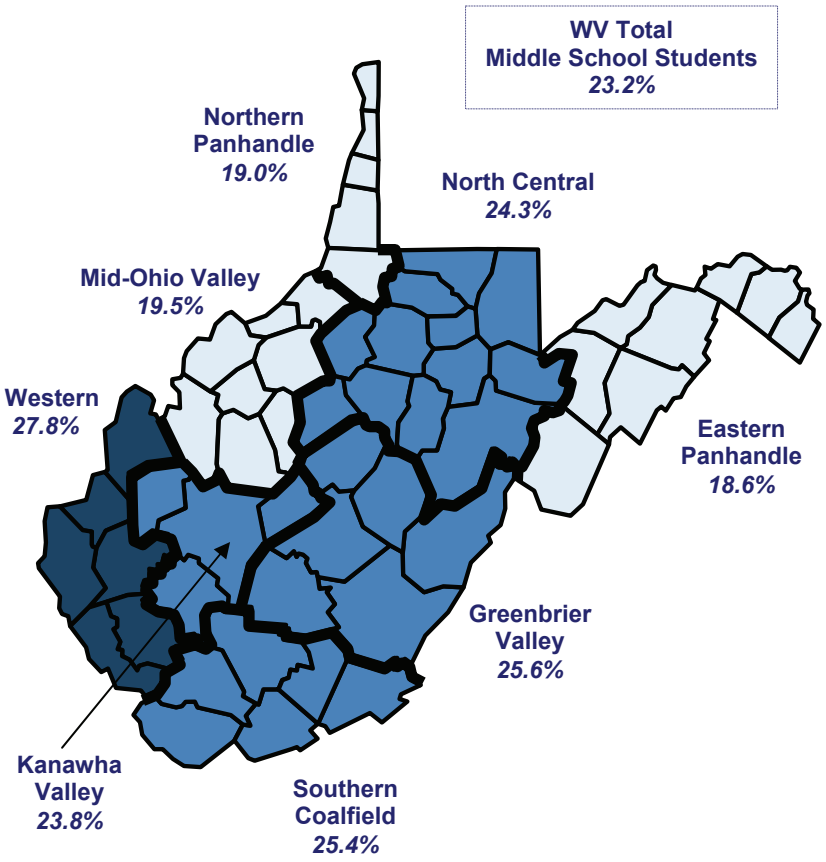
1. ASTHMA PREVALENCE

KEY FINDINGS - CHILDREN

Regional estimates of asthma prevalence can be calculated from the 2002 YTS for West Virginia public middle school students. Typically, there are too few YTS respondents to calculate reliable county or regional estimates. However, in 2002, more than 10,000 public middle school students completed the survey. Currently, this is the only source for county or regional estimates of asthma among West Virginia children and/or youth.

- *In 2002, 23.2% of West Virginia public middle school students had ever been diagnosed with asthma. The Western Region had a significantly higher prevalence of lifetime asthma than West Virginia.*
- *Three regions had a significantly lower prevalence than West Virginia: Eastern Panhandle, Mid-Ohio Valley, and Northern Panhandle.*
- *The prevalence of lifetime asthma among public middle school students was significantly higher in the Western Region than the Eastern Panhandle, Mid-Ohio Valley, and Northern Panhandle.*

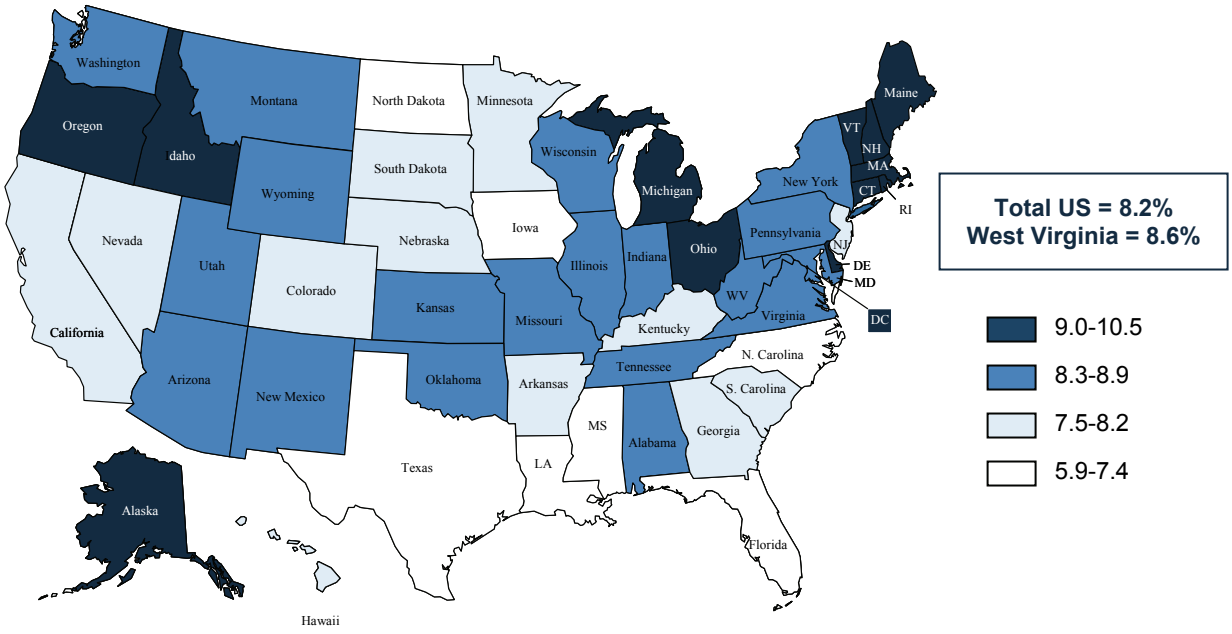
Figure 1.16
Lifetime Asthma among Public Middle School Students by Region, 2002



Data Source: West Virginia Youth Tobacco Survey.
Population: West Virginia public middle school students.
Lifetime Asthma = Responding "yes" to "Have you ever been told by a doctor that you have asthma?"
See Appendix D for 95% confidence intervals and a listing of the counties within each region.

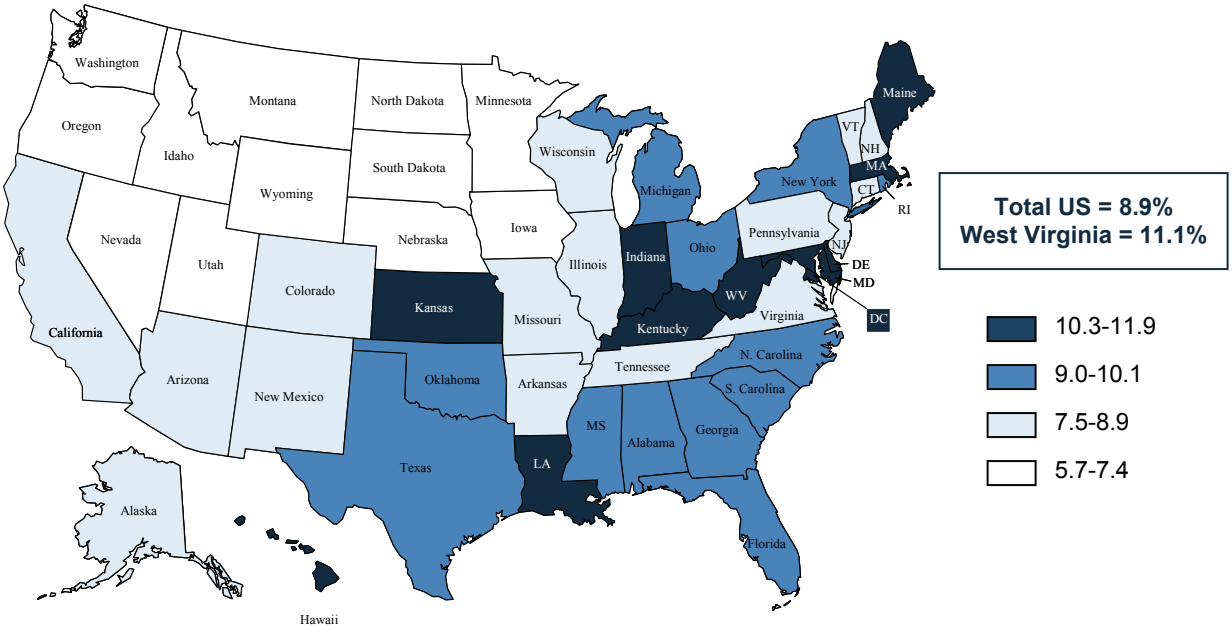
1. ASTHMA PREVALENCE

Figure 1.17
Adult Current Asthma by State, 2006



Data Source: Behavioral Risk Factor Surveillance System, 2006.
Population: Adults age 18 and older.
Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
See Appendix D for state prevalence estimates and 95% confidence intervals.

Figure 1.18
Child Current Asthma by State, 2003



Data Sources: National Survey of Children's Health, 2003.
Population: Children age 17 and younger.
NSCH Current Asthma = Responding "yes" to both "Has a doctor or health professional ever told you that [child] has…asthma?" and "Does [child] still have asthma?"
See Appendix D for state prevalence estimates and 95% confidence intervals.

2. SYMPTOMS & DISEASE MANAGEMENT

Asthma Symptoms and Disease Management Defined

Asthma symptoms include wheezing, coughing, difficulty breathing, and chest tightness (1,2,3). Asthma symptoms occur when an individual with asthma is exposed to certain triggers, such as allergens (e.g., pet dander, pollen, and mold) or irritants (e.g., tobacco smoke and strong odors). These symptoms can vary within an individual by time of day and can change throughout one's lifetime. Fortunately, asthma symptoms can be controlled, allowing many people with asthma to live healthy, active lives. However, poor asthma management can result in frequent symptoms, activity limitations, and decreased quality of life.

There are three essential components of a successful asthma management plan:

- **Determination of asthma severity.** The National Asthma Education and Prevention Program's (NAEPP) *Guidelines for the Diagnosis and Management of Asthma* (12) outlines the criteria for determining asthma severity. Asthma severity classifications are assigned by health care professionals based on frequency and severity of asthma symptoms, as well as the degree of lung functioning, before medical treatment. There are four severity classifications: mild intermittent, mild persistent, moderate persistent, and severe persistent.

- **Appropriate asthma medication use.** The NAEPP *Guidelines for the Diagnosis and Management of Asthma* (12) also outlines the appropriate pharmacotherapy associated with each asthma severity classification. There are two types of asthma medications: quick-relief and long-term controller. Quick-relief medications are used to relieve symptoms during an asthma attack, whereas long-term controller medications are typically taken daily to prevent asthma attacks from occurring (3). The guidelines recommend that individuals with persistent asthma take a daily long-term controller medication.

- **Avoidance of identified asthma triggers.** Individuals with asthma must identify and avoid the allergens, irritants, and behaviors that trigger their asthma symptoms.

Asthma Symptoms and Disease Management Data

Information on asthma symptoms and disease management is obtained from self-reported surveys. This information has only recently been collected in West Virginia. In 2005 and 2006, the West Virginia Behavioral Risk Factor Surveillance System (BRFSS) collected data on frequency of asthma symptoms, asthma medication use, and asthma-related activity limitations from adults with asthma.

The 2003 National Survey of Children's Health (NSCH) and the 2002 and 2005 West Virginia Youth Tobacco Surveys (YTS) also include questions that provide limited information on asthma symptoms, medication use, and missed school days among children and youth with asthma in West Virginia. See Appendix A for a discussion of the methodologies and limitations of these surveys and Appendix B for a list of the asthma-related questions included in each survey.

The West Virginia BRFSS program is currently conducting the 2007 Asthma Call-back Survey. BRFSS respondents who reported that they had ever had asthma are asked to participate in a follow-up survey, containing more than 80 detailed questions about their asthma symptoms, triggers, medications, and health care utilization.

Questions on asthma severity classification are not included in the BRFSS, NSCH, or YTS. However, asthma severity can be estimated for adults based on responses to the other BRFSS asthma symptom and disease management questions.

This Chapter

This chapter presents data on asthma symptoms and disease management (i.e., medication use, exposure to triggers, and quality of life) for West Virginia adults and children with asthma. The following figures include BRFSS, NSCH, and YTS prevalence estimates and 95% confidence intervals. Refer to Appendix C for a discussion of the methodologies used during analysis and interpretation.

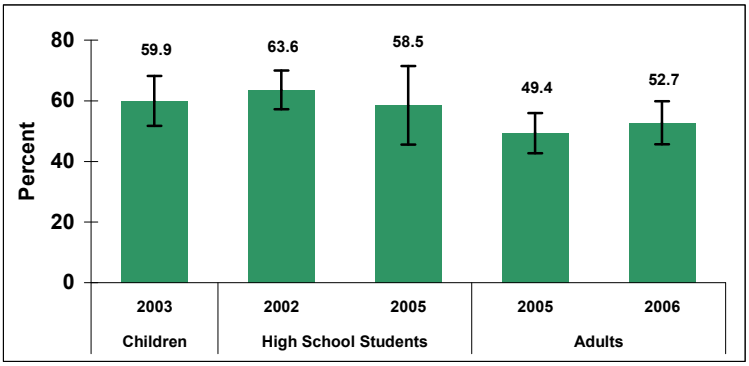
2. SYMPTOMS & DISEASE MANAGEMENT

KEY FINDINGS - SYMPTOMS

During an asthma episode or attack, the linings of the airways swell, mucus blocks the airways, and the muscles around the airways tighten causing symptoms such as difficulty breathing, wheezing, and coughing (1,2,3). Frequent asthma symptoms and attacks are an indication of poorly managed asthma.

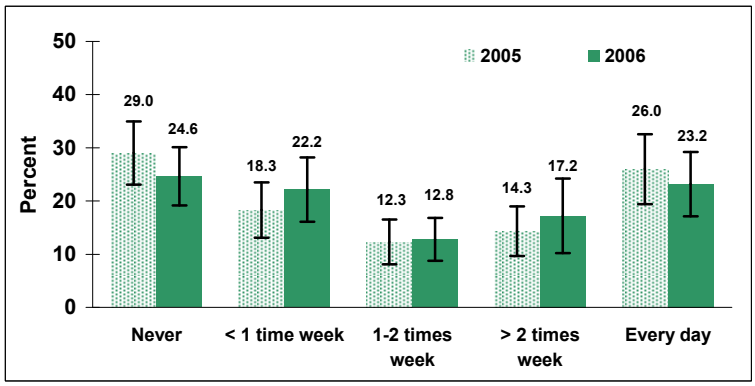
- *Most West Virginians with asthma have had an asthma attack within the past 12 months.*
- *According to the 2006 BRFSS, 24.6% of adults with asthma had no asthma symptoms in the 30 days prior to the survey. However, more than one-fifth (23.2%) of adults with asthma had asthma symptoms daily in the past 30 days.*
- *According to the BRFSS, more than half of adults with asthma experienced sleep difficulties because of asthma symptoms in the 30 days prior to the survey. In 2006, 22% of adults had difficulty sleeping because of asthma symptoms on 5 or more days in the 30 days prior to the survey.*

Figure 2.1
Asthma Attack in Past 12 Months



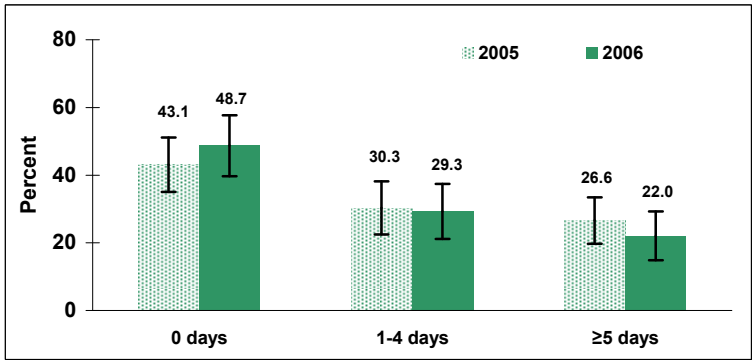
Data Sources: National Survey of Children's Health, 2003; Youth Tobacco Survey, 2002 and 2005; Behavioral Risk Factor Surveillance System, 2005 and 2006.
Populations: Children = West Virginia children age 17 and younger with current asthma; High School Students = West Virginia public high school students with current asthma; Adults = West Virginians age 18 and older with current asthma.
NSCH = Responding "yes" to "During the past 12 months, has [child] had an episode of asthma or an asthma attack?"; YTS = Responding "yes" to "Have you had an asthma attack or episode of asthma in the past 12 months?"; BRFSS = Responding "yes" to "During the past 12 months, have you had an episode of asthma or an asthma attack?"

Figure 2.2
Adult Asthma Symptoms in Past 30 Days



Data Source: Behavioral Risk Factor Surveillance System, 2005 and 2006.
Population: West Virginians age 18 and older with current asthma.
Asthma Symptoms = "Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness and phlegm production when you do not have a cold or respiratory infection. During the past 30 days, how often did you have any symptoms of asthma?"

Figure 2.3
Adult Asthma Sleep Disturbances in Past 30 Days



Data Source: Behavioral Risk Factor Surveillance System, 2005 and 2006.
Population: West Virginians age 18 and older with current asthma.
Asthma-Related Sleep Disturbances = "During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?"

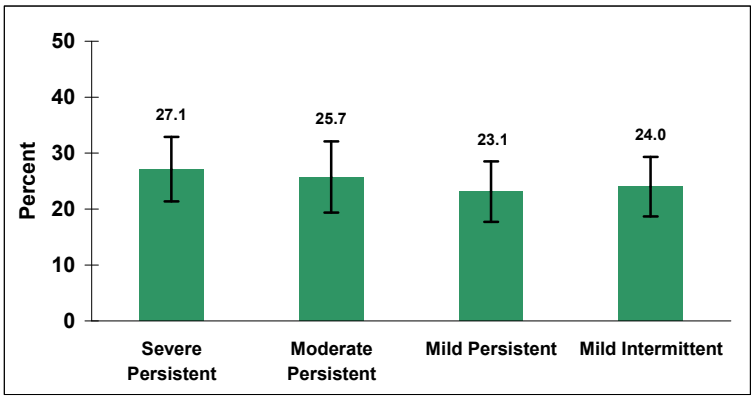
2. SYMPTOMS & DISEASE MANAGEMENT

Table 2.1
Asthma Severity Classifications

	Clinical Features Before Treatment*	
	Symptoms**	Nighttime Symptoms
Severe Persistent	▪ Continual symptoms ▪ Limited physical activity ▪ Frequent exacerbations	Frequent
Moderate Persistent	▪ Daily symptoms ▪ Daily use of inhaled short-acting beta$_2$-agonist (rescue inhaler) ▪ Exacerbations affect activity ▪ Exacerbations ≥2 times a week; may last days	>1 night a week
Mild Persistent	▪ Symptoms >2 days a week but <1 time a day ▪ Exacerbations may affect activity	>2 nights a month
Mild Intermittent	▪ Symptoms ≤2 days a week ▪ Asymptomatic and normal peak expiratory flow between exacerbations ▪ Exacerbations brief (from a few hours to a few days); intensity may vary	≤2 nights a month

* The presence of one of the features of severity is sufficient to place a patient in that category. An individual should be assigned to the most severe grade in which any feature occurs. The characteristics noted in this figure are general and may overlap because asthma is highly variable. Furthermore, an individual's classification may change over time.
** Patients at any level of severity can have mild, moderate, or severe exacerbations. Some patients with intermittent asthma experience severe and life-threatening exacerbations separated by long periods of normal lung function and no symptoms.
Data Source: National Heart Lung and Blood Institute. *National Asthma Education and Prevention Program Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma.*1997 (12).

Figure 2.4
Adult Asthma Severity Classification, 2005-2006



Data Source: Behavioral Risk Factor Surveillance System, 2005-2006.
Population: West Virginians age 18 and older with current asthma.
Severity Classification = Assigned based on responses to survey questions about asthma symptoms, sleep disturbances, medication use, and activity limitations.
See Appendix C for a discussion of the methodology used to assign severity.
Note: This methodology may underestimate asthma severity.

KEY FINDINGS - SEVERITY

There are four asthma severity classifications: mild intermittent, mild persistent, moderate persistent, and severe persistent. These classifications are assigned based on frequency and severity of asthma symptoms and lung functioning before medical treatment. Table 2.1 outlines the asthma symptom criteria used to determine severity (12). BRFSS questions related to asthma symptoms, medication use, and activity limitations can be used to estimate asthma severity classification.

► *It is estimated that, in 2005-2006, more than one-fourth (27.1%) of West Virginia adults with asthma had severe persistent asthma; 24.0% of West Virginia adults with asthma had mild intermittent asthma.*

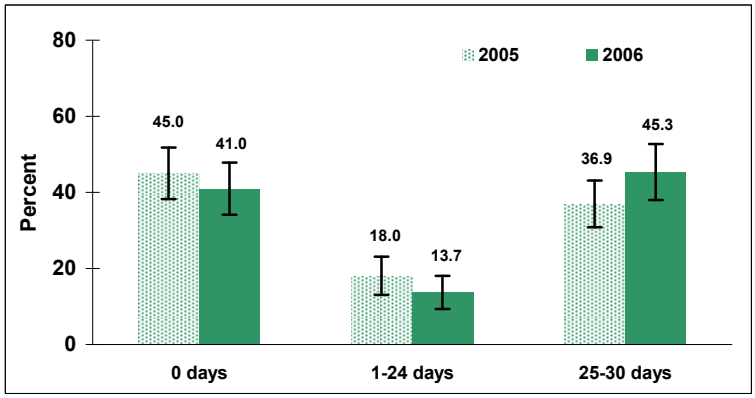
2. SYMPTOMS & DISEASE MANAGEMENT

KEY FINDINGS ASTHMA MANAGEMENT

Adequate medication use is essential to proper asthma management. Overuse of short-acting rescue medications is an indication of poorly controlled asthma.

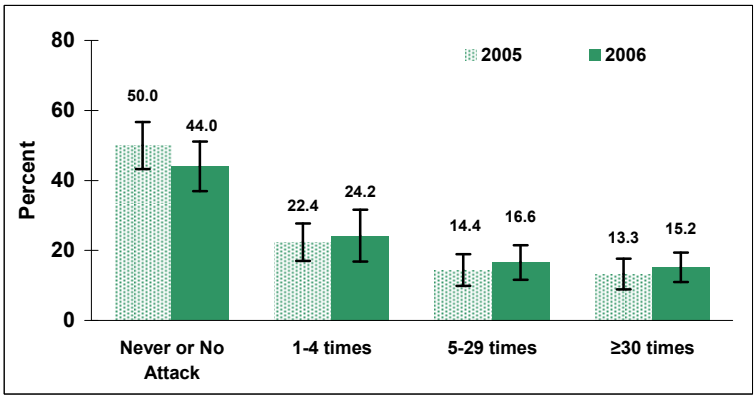
- *Asthma controller medications are prescribed for patients with persistent asthma to prevent asthma attacks from occurring. According to the 2006 BRFSS, 45.3% of adults with asthma took an asthma controller medication on 25-30 days of the 30 days prior to the survey; 41% of adults with asthma did not take a controller medication at any time in the 30 days prior to the survey.*
- *Quick-relief asthma medications are taken to relieve symptoms during an asthma attack. They are typically administered through a metered-dose inhaler. According to the 2006 BRFSS, 44% of adults with asthma did not use an asthma rescue inhaler in the 30 days prior to the survey; 15.2% used a rescue inhaler 30 or more times in the past 30 days.*
- *According to the 2003 NSCH, more than one-third of West Virginia children with asthma last took asthma medication within the day prior to the survey.*
- *Nearly 60% of public high school students with asthma take prescription asthma medication (2002: 56.5%; 2005: 58.6%).*

Figure 2.5
Adult Asthma Controller Medication Use Past 30 Days



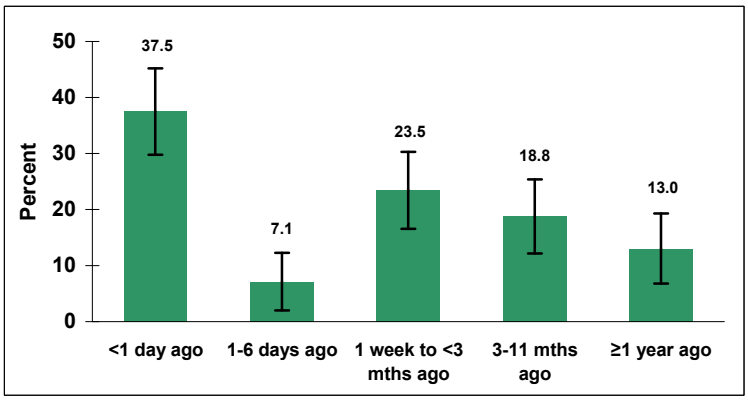
Data Source: Behavioral Risk Factor Surveillance System, 2005 and 2006.
Population: West Virginians age 18 and older with current asthma.
Asthma Controller Medication Use = "During the past 30 days, how often did you take a prescription asthma medication to prevent an asthma attack from occurring?"

Figure 2.6
Adult Asthma Rescue Inhaler Use in Past 30 Days



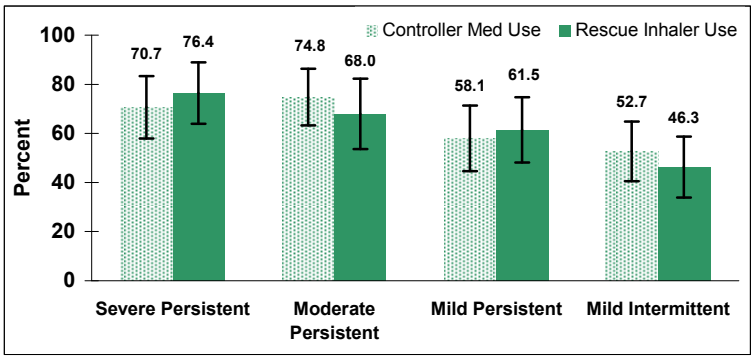
Data Source: Behavioral Risk Factor Surveillance System, 2005 and 2006.
Population: West Virginians age 18 and older with current asthma.
Asthma Rescue Inhaler Use = "During the past 30 days, how often did you use a prescription asthma inhaler during an asthma attack to stop it?"

Figure 2.7
Child Last Asthma Medication Use, 2003



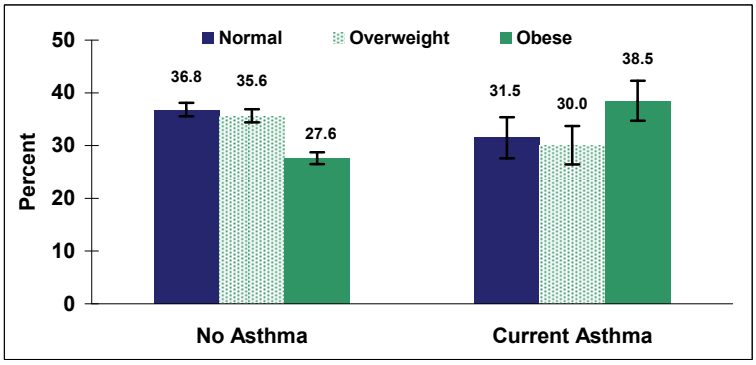
Data Source: National Survey of Children's Health, 2003.
Population: West Virginians age 17 and younger with current asthma.
Last Asthma Medication Use = "How long has it been since [he/she] last took asthma medication?"

Figure 2.8
Adult Asthma Medication Use by Severity, 2005-2006



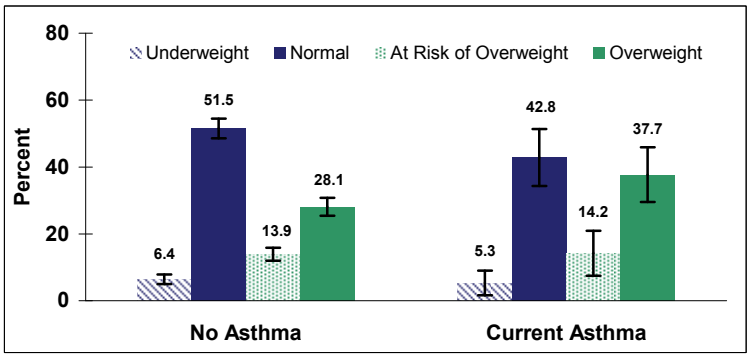
Data Source: Behavioral Risk Factor Surveillance System, 2005-2006.
Population: West Virginians age 18 and older with current asthma.
Controller Med Use = Responding "1-30 days" to "During the past 30 days, how often did you take a prescription asthma medication to prevent an asthma attack from occurring?"
Rescue Inhaler Use = Responding "1 or more times" to "During the past 30 days, how often did you use a prescription asthma inhaler during an asthma attack to stop it?"
See Appendix C for a discussion of the methodology used to assign severity.
Note: This methodology may underestimate asthma severity.

Figure 2.9
Adult BMI by Asthma Status, 2003-2005



Data Source: Behavioral Risk Factor Surveillance System, 2003-2005.
Population: West Virginians age 18 and older.
BMI = Body Mass Index equals weight in kilograms divided by height in meters squared.
Normal = BMI <25.0. Overweight = BMI 25.0-29.9. Obese = BMI ≥30.0.
Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Figure 2.10
Child BMI by Asthma Status



Data Source: National Survey of Children's Health, 2003.
Population: West Virginians age 17 and younger.
BMI = Body Mass Index equals weight in kilograms divided by height in meters squared.
Child BMI is plotted on sex-specific BMI-for-age growth charts to obtain a percentile ranking. Underweight = <5th percentile. Normal = 5th percentile to <85th percentile.
At Risk of Overweight = 85th percentile to <95th percentile. Overweight = ≥95th percentile.

KEY FINDINGS ASTHMA MANAGEMENT

- *Asthma medication use increases with asthma severity, although the increase is not significant. More than half (52.7%) of adults with mild intermittent asthma used a controller medication during the 30 days prior to the survey, compared with 70.7% of adults with severe persistent asthma.*

Research suggests that being overweight or obese increases the risk of developing asthma (17) and that those individuals with asthma who lose weight experience less severe symptoms and fewer asthma-related hospitalizations (18). Although the relationship between obesity and asthma has not been fully established, research does suggest a causal relationship, indicating that maintaining a healthy weight is important to asthma management (18).

- *Adults with asthma are significantly more likely to be obese than adults without asthma. In fact, 38.5% of adults with asthma are obese, compared with 27.6% of adults without asthma.*

- *More than one-third (37.7%) of children with asthma are overweight and 14.2% are at risk of being overweight. The prevalence of overweight is higher among children with asthma than among those without asthma, although the difference is not significant.*

KEY FINDINGS ASTHMA MANAGEMENT

Cigarette smoking and exposure to environmental tobacco smoke are common asthma triggers. In fact, research indicates that children who smoke on a regular basis are at greater risk of developing asthma than those who do not smoke (19).

- *The prevalence of asthma is significantly higher among adults who are cigarette smokers than adults who are not. More than 1 out of 10 (11.7%) adult smokers have asthma, compared with 8.2% of nonsmokers.*
- *More than one-third (34.5%) of adults and 31.3% of public high school students with asthma are current cigarette smokers.*
- *The prevalence of cigarette smoking is significantly higher among adults with asthma than adults without asthma. In fact, 34.5% of adults with asthma are current smokers, compared with 26.1% of adults without asthma.*

Figure 2.11
Current Asthma by Cigarette Smoking Status

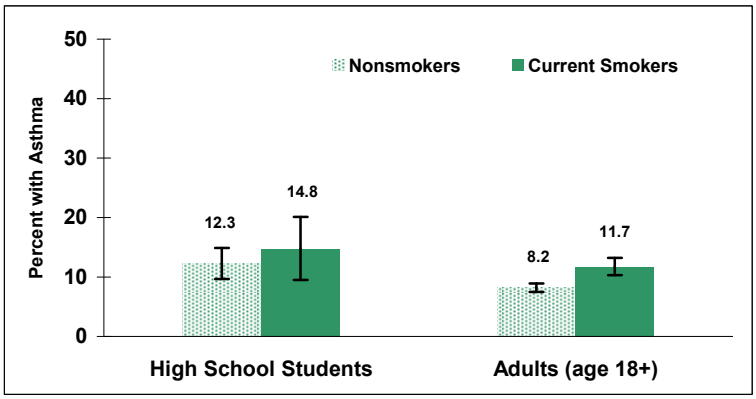
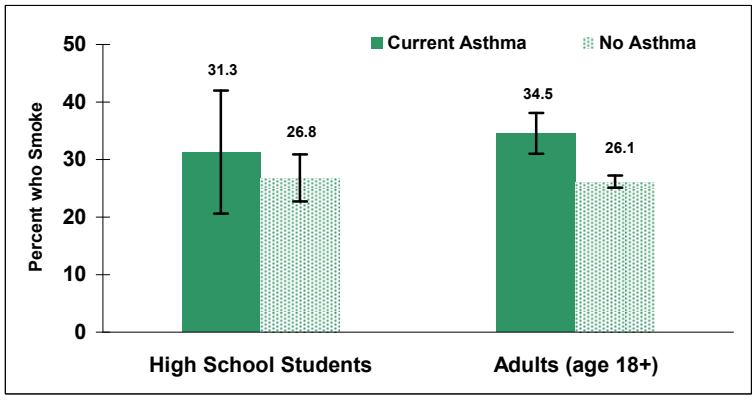
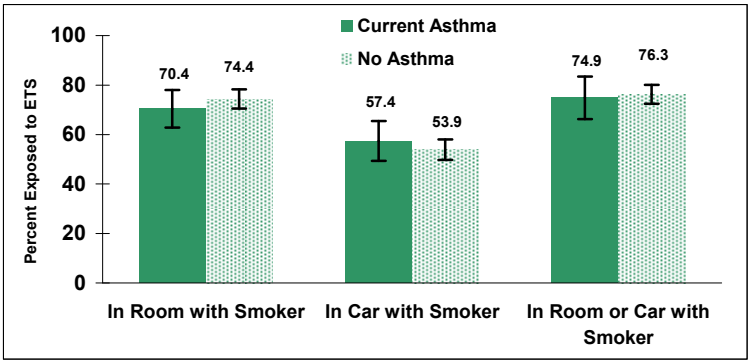


Figure 2.12
Current Cigarette Smoking by Asthma Status



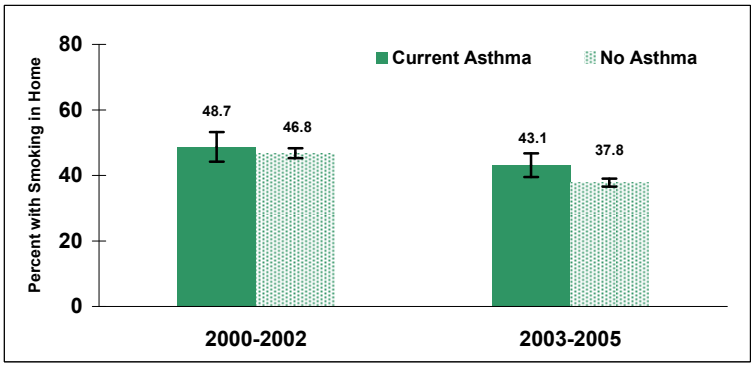
Figures 2.11 and 2.12:
Data Sources: Behavioral Risk Factor Surveillance System, 2003-2005; West Virginia Youth Tobacco Survey, 2005.
Population: High School Students = West Virginia public high school students; Adults = West Virginians age 18 and older.
HS Students Current Smoking = Responded "1-30 days" to "During the past 30 days, on how many days did you smoke cigarettes?"
Adult Current Smoking = Responding "yes" to "Have you ever smoked 100 cigarettes in your entire life?" and responding "every day" or "some days" to "Do you now smoke cigarettes every day, some days, or not at all?"
HS Students Current Asthma = Responding "yes" to "Have you ever been told by a doctor that you have asthma?" or "Have you ever been told by a health care professional that you have asthma?" and "Do you still have asthma?"
Adult Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Figure 2.13
Youth ETS Exposure in Past Week by Asthma Status



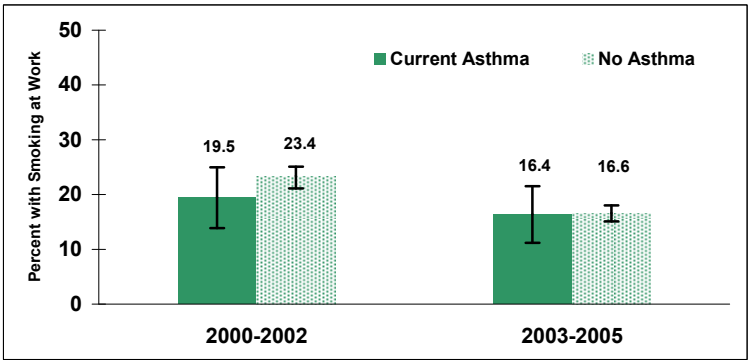
Data Source: West Virginia Youth Tobacco Survey, 2005.
Population: West Virginia public high school students.
In Room with Smoker = Responded "1-7 days" to "During the past seven days, on how many days were you in the same room with someone who was smoking?"
In Car with Smoker = Responded "1-7 days" to "During the past seven days, on how many days did you ride in a car with someone who was smoking cigarettes?"

Figure 2.14
Adult Smoking in Home by Asthma Status



Data Source: Behavioral Risk Factor Surveillance System.
Population: West Virginians age 18 and older.
Smoking in Home = Responded "Smoking is allowed in some places or at some times" or "Smoking is allowed anywhere inside the home" or "There are no rules about smoking inside the home" to "Which statement best describes the rules about smoking inside your home?"

Figure 2.15
Adult Smoking in Workplace by Asthma Status



Data Source: Behavioral Risk Factor Surveillance System. Population: West Virginia adults.
Smoking in Workplace = Responded "Allowed in some public areas" or "Allowed in all public areas" to "Which of the following best describes your place of work's official smoking policy for indoor public or common areas, such as lobbies, rest rooms, and lunch rooms?" or responded "Allowed in some work areas" or "Allowed in all work areas" to "Which of the following best describes your place of work's official smoking policy for work areas?"

KEY FINDINGS ASTHMA MANAGEMENT

According to *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General* released in 2006, children with asthma exposed to environmental tobacco smoke (ETS) experience more frequent and severe asthma attacks (20). Research also suggests that increases in childhood asthma prevalence in the United States over the past few decades may be due to increases in adult cigarette smoking and exposure to ETS (21).

- *A majority of West Virginia public high school students are exposed to ETS. Nearly three-fourths (74.9%) of high school students with asthma were in a room or car with someone who was smoking cigarettes on one or more days in the seven days prior to the survey. Exposure to ETS does not significantly differ by asthma status.*
- *In 2003-2005, 43.1% of adults with asthma lived in a home where smoking is allowed or where there are no rules about smoking. Adults with asthma were significantly more likely to live in a home where smoking is allowed than adults without asthma.*
- *In 2003-2005, 16.4% of adults with asthma were employed in a workplace that allows smoking in some public common areas or work areas.*

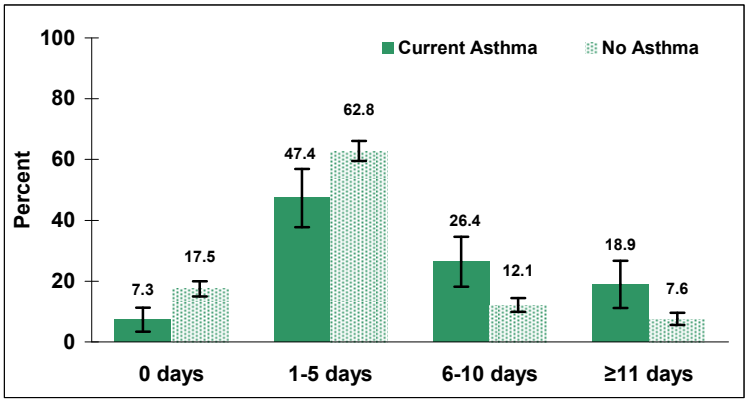
2. SYMPTOMS & DISEASE MANAGEMENT

KEY FINDINGS QUALITY OF LIFE

Individuals with asthma can lead healthy, active lives. However, poorly controlled asthma can result in symptoms that lead to activity limitations and poor health.

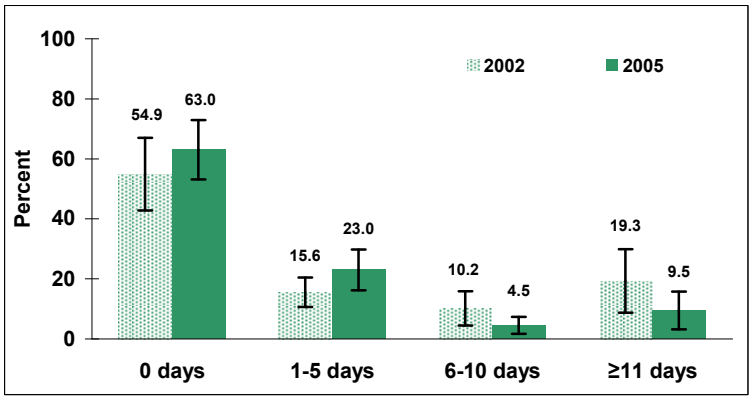
- *Nationally, asthma is the leading cause of school absence due to chronic disease (6). In West Virginia, children with asthma are significantly more likely than those without asthma to miss school because of illness or injury (92.7% vs. 82.5%).*
- *Children with asthma are also significantly more likely to miss multiple days of school than those without asthma. According to the 2003 NSCH, 18.9% of children with asthma and 7.6% of those without asthma missed 11 or more days of school because of illness or injury during the 12 months prior to the survey.*
- *More than one-third (37%) of West Virginia public high school students with asthma missed school because of their asthma during the 2004-2005 school year; 9.5% missed 11 or more days of school because of their asthma.*
- *In 2006, 30.2% of adults experienced asthma-related activity limitations in the past year. In fact, 15.6% of adults with asthma were unable to carry out their usual activities because of their asthma on 7 or more days in the 12 months prior to the survey.*

Figure 2.16
Child Missed School Days in Past Year, 2003



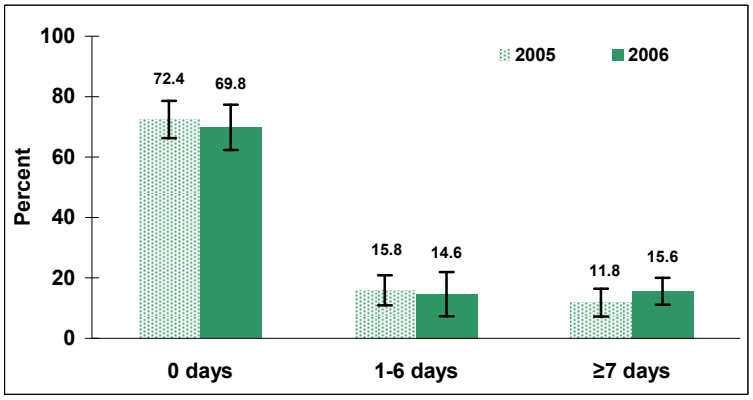
Data Source: National Survey of Children's Health, 2003.
Population: West Virginians age 17 and younger.
Missed School Days = "During the past 12 months, about how many days did [child] miss school because of illness or injury?"

Figure 2.17
Youth Asthma-Related Missed School Days in Past Year



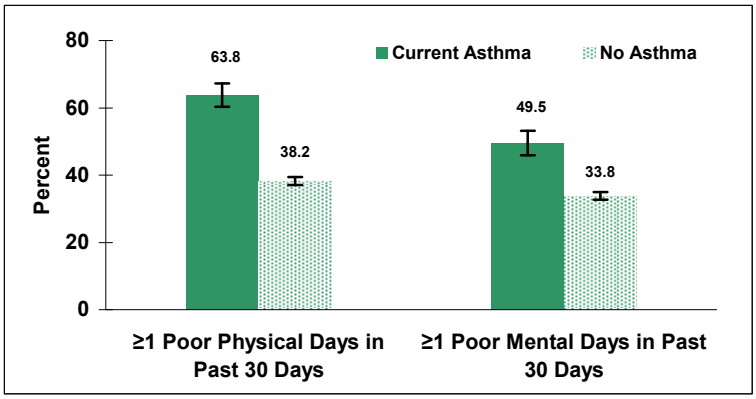
Data Source: Youth Tobacco Survey, 2002 and 2005.
Population: West Virginia public high school students with current asthma.
Missed School Days = "During this school year, how many days of school did you miss due to your asthma?"

Figure 2.18
Adult Asthma-Related Activity Limitations in Past Year



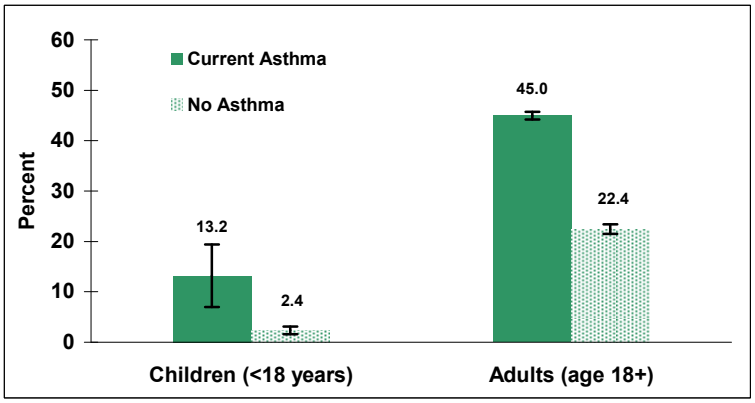
Data Source: Behavioral Risk Factor Surveillance System, 2005 and 2006.
Population: West Virginians age 18 and older with current asthma.
Asthma-Related Activity Limitation = "During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?"

Figure 2.19
Adult Poor Physical and Mental Health Days



Data Source: Behavioral Risk Factor Surveillance System, 2003-2005.
Population: West Virginia adults age 18 and older.
Poor Physical Days = Responded "1" to "30" to "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?"
Poor Mental Days = Responded "1" to "30" to "Now thinking about your physical health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"

Figure 2.20
Fair or Poor Health by Asthma Status



Data Sources: National Survey of Children's Health, 2003; Behavioral Risk Factor Surveillance System, 2003-2005.
Population: West Virginia children age 17 and younger; West Virginia adults age 18 and older.
Children = Responding "fair" or "poor" to "In general, how would you describe [child's] health? Would you say [his/her] health is excellent, very good, good, fair, or poor?"
Adults = Responding "fair" or "poor" to "Would you say that in general your health is excellent, very good, good, fair, or poor?"

KEY FINDINGS QUALITY OF LIFE

- *Nearly 2 out of 3 (63.8%) adults with asthma had one or more poor physical health days in the past 30 days; nearly half (49.5%) had one or more poor mental health days. Adults with asthma were significantly more likely to have poor physical and mental health days than adults without asthma.*
- *Approximately 13.0% of West Virginia children and 45.0% of West Virginia adults with asthma have fair or poor health. Children and adults with asthma are significantly more likely to have fair or poor health than those without asthma.*

3. HEALTH CARE ACCESS & UTILIZATION

Health Care Access and Utilization Defined

Health care access is the ability to obtain medical care, and is typically measured by indicators of health care coverage and the presence of a primary care provider. Health care utilization is the use of medical care, including routine preventive visits, emergency room (ER) visits, and hospitalizations. Access to health care and routine check-ups are essential to proper asthma management. In fact, the National Asthma Education and Prevention Program (NAEPP) recommends primary care visits at least every six months, to assess and monitor asthma symptoms and modify management plans as needed (22). However, asthma-related ER visits and hospitalizations are an indication of poorly controlled asthma. These acute care visits are often preventable through appropriate medication use and avoidance of identified triggers. Analyses of health care access and asthma-related health care visits can help us identify:

- Groups at highest risk for hospitalization due to poorly controlled asthma.
- Disparities in access to primary health care.
- Medical costs associated with asthma.

Health Care Access and Utilization Data

Information on health care access and utilization can generally be obtained through two mechanisms: self-reports of health care coverage and health care visits, or analysis of administrative and medical claims data that capture this information for billing purposes. This chapter presents data from both sources.

Health care coverage and access is typically estimated from random, self-reported surveys. In West Virginia, these indicators are collected by the Behavioral Risk Factor Surveillance System (BRFSS) for adults and the National Survey of Children's Health (NSCH) for children. The BRFSS and NSCH also collect information on health care visits. In fact, beginning in 2005, the BRFSS began measuring routine, sick, and ER/urgent care visits specifically related to asthma. See Appendix A for a discussion of the methodologies and limitations of these surveys and Appendix B for a list of the asthma-related questions included in each survey.

Administrative claims data provide comprehensive information on all health care visits among the population represented by the data. In West Virginia, all non-federal hospitals are required to report information on all discharges to the West Virginia Health Care Authority (WVHCA). The hospital discharge database contains data on diagnosis and procedure codes, admission source, charges, primary payor, and patient characteristics (e.g., age, sex, martial status, and county of residence). Hospitalizations in the United States are obtained from the National Hospital Discharge Survey, conducted by the Centers for Disease Control and Prevention, National Center for Health Statistics (23). Asthma hospitalizations are defined as discharges with a primary diagnosis of asthma (ICD-9-CM 493.xx).

This Chapter

This chapter presents data on health care access and asthma-related health care utilization for West Virginia adults and children. The following figures include BRFSS and NSCH prevalence estimates and 95% confidence intervals, as well as asthma hospitalization rates calculated from the WVHCA's hospital discharge database and the National Hospital Discharge Survey. Refer to Appendix C for a discussion of the methodologies used during analysis and interpretation.

3. HEALTH CARE ACCESS & UTILIZATION

KEY FINDINGS - ACCESS

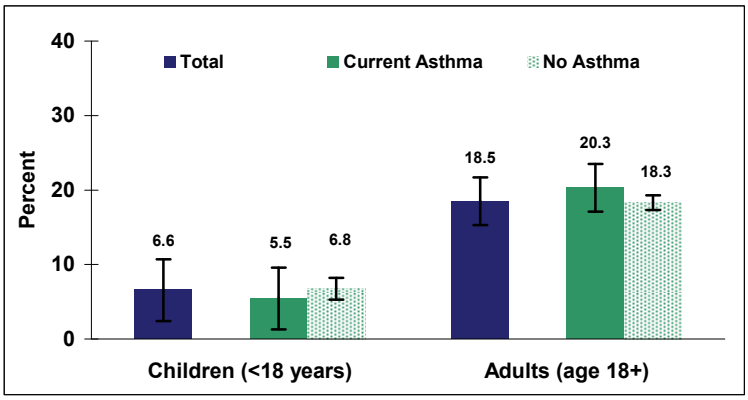
- *Nearly one out of five (18.5%, 95% CI: 17.6-19.5) West Virginia adults and 6.6% (95% CI: 5.3-7.9) of West Virginia children do not have health care coverage. Health care coverage does not significantly differ by asthma status.*

- *More than half (56.2%, 95% CI: 53.5-58.8) of West Virginia children have health care coverage through a private insurer and more than one-third (37.2%, 95% CI: 34.6-39.8) are insured through public programs such as Medicaid or the Children's Health Insurance Program (CHIP). Children with public health care coverage are significantly more likely to have asthma than children with private coverage (15.0% vs. 8.0%).*

- *More than half of children with asthma have public health care coverage. Children with asthma are significantly more likely to have public health care coverage than children without asthma (52.4% vs. 35.4%).*

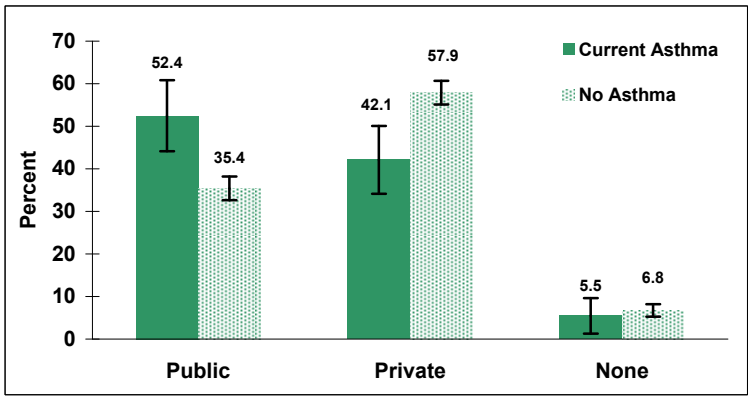
- *A personal doctor or health care provider is an important component of proper asthma management. West Virginia children and adults with asthma are significantly more likely to have a personal doctor than those without asthma. However, 5.4% of children and 16.4% of adults with current asthma do not have one person they think of as their health care provider.*

Figure 3.1
No Health Care Coverage



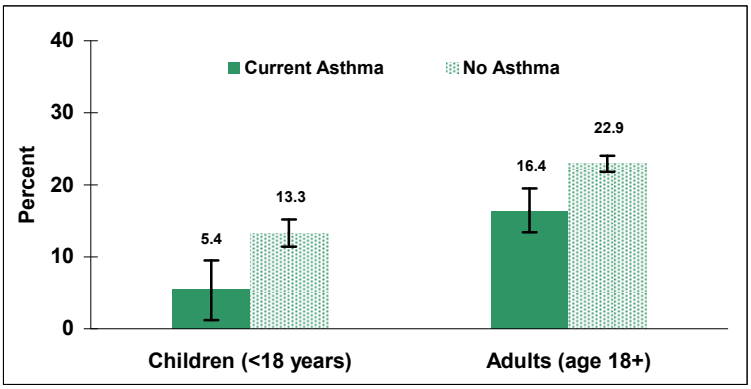
Data Sources: National Survey of Children's Health, 2003; Behavioral Risk Factor Surveillance System, 2003-2005.
Population: West Virginia children age 17 and younger; West Virginia adults age 18 and older.
Child Health Care Coverage = Derived variable from the following questions: "Does [child] have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicaid?" and "Is [he/she] insured by Medicaid or the State Children's Health Insurance Program?"
Adult Health Care Coverage = Responding "no" to "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?"

Figure 3.2
Child Type of Health Care Coverage



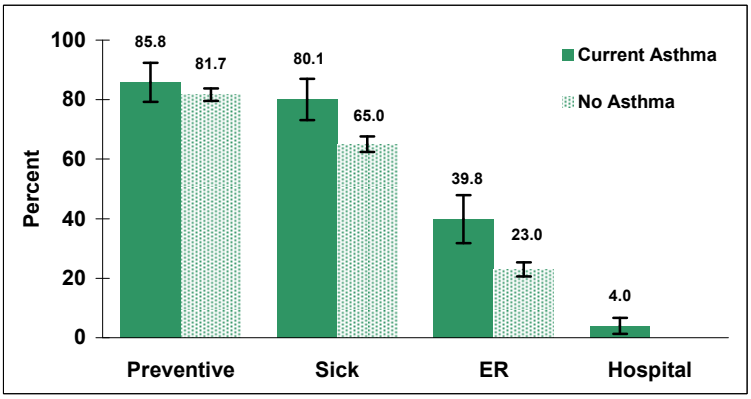
Data Source: National Survey of Children's Health, 2003.
Population: West Virginia children age 17 and younger.
Type of Health Care Coverage = Derived variable from the following questions: "Does [child] have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicaid?" and "Is [he/she] insured by Medicaid or the State Children's Health Insurance Program?"

Figure 3.3
No Personal Doctor or Health Care Provider



Data Sources: National Survey of Children's Health, 2003; Behavioral Risk Factor Surveillance System, 2003-2005.
Population: West Virginia children age 17 and younger; West Virginia adults age 18 and older.
Child No Personal Doctor = "Do you have one or more persons you think of as [child]'s personal doctor or nurse?"
Adult No Personal Doctor = Responding "no" to "Do you have one person you think of as your personal doctor or health care provider?"

Figure 3.4
Child Health Care Visits in Past 12 Months



Data Source: National Survey of Children's Health, 2003.
Population: West Virginia children age 17 and younger.
Preventive Visit = Responded "1 or more times" to "During the past 12 months, how many times did [child] see a doctor, nurse, or other health care professional for preventive medical care such as a physical exam or well-child check-up?"
Sick Visit = Responded "1 or more times" to "Excluding emergency room visits, hospitalizations, and well-child care, how many times during the past 12 months did [he/she] see a doctor, nurse, or other health care professional for sick-child care?"
ER Visit = Responded "1 or more times" to "During the past 12 months, how many times did [child] go to a hospital emergency room about [his/her] health? This includes emergency room visits that resulted in a hospital admission."
Hospital Visit = Responded "yes" to "During the past 12 months, has [CHILD] stayed overnight in a hospital because of [his/her] asthma?" This question was asked only about children who had ever been diagnosed with asthma.

KEY FINDINGS - VISITS

Health care visits are an indicator of asthma management. Whereas preventive visits are essential to proper management, sick visits, emergency room visits, and hospitalizations are indicators of poorly controlled asthma. These visits are often preventable through adequate medication use and avoidance of identified triggers.

- *Approximately 8 out of 10 (82.1%, 95% CI: 80.1-84.1) West Virginia children visited a doctor for a preventive medical exam, such as a physical exam or well-child check-up, in the 12 months prior to the survey. Preventive visits did not significantly differ by asthma status.*
- *Approximately 80% of children with current asthma visited the doctor due to illness and nearly 40% visited the ER in the 12 months prior to the survey. Children with current asthma were significantly more likely than those without asthma to have had a sick visit or ER visit.*
- *Approximately 1,700 (4.0%) West Virginia children with current asthma stayed overnight in the hospital due to their asthma in the 12 months prior to the survey.*

3. HEALTH CARE ACCESS & UTILIZATION

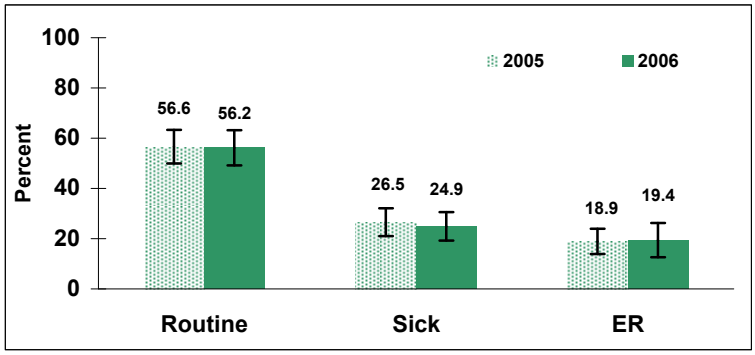
KEY FINDINGS - VISITS

- *In 2006, more than half (56.2%) of West Virginia adults with asthma visited a doctor for a routine asthma checkup in the 12 months prior to the survey.*
- *In 2006, approximately one in four (24.9%) adults with current asthma visited their doctor for treatment of urgent or worsening asthma symptoms and nearly one-fifth (19.4%) visited an emergency room because of their asthma in the 12 months prior to the survey.*

KEY FINDINGS - INPATIENT HOSPITALIZATIONS

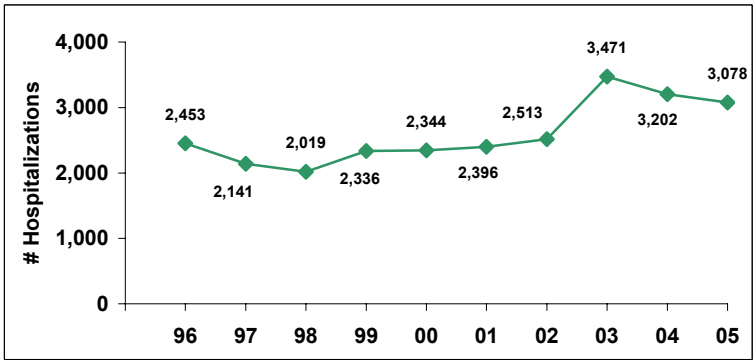
- *Between 1996 and 2005, there was an average of nearly 2,600 hospitalizations with a primary diagnosis of asthma each year in West Virginia.*
- *Between 1996 and 2002, the rate of asthma hospitalizations in West Virginia was relatively stable. However, in 2003, the asthma hospitalization rate increased sharply in both West Virginia and the United States. Although the West Virginia rate declined in both 2004 and 2005, these asthma hospitalization rates remain well above the rates from 1996-2002.*
- *In 2004 and 2005, the rate of asthma hospitalizations was higher in West Virginia than the United States.*

Figure 3.5
Adult Asthma Health Care Visits in Past 12 Months



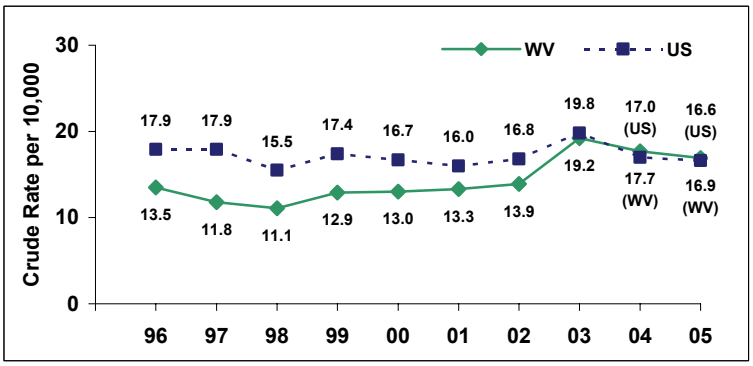
Data Source: Behavioral Risk Factor Surveillance System, 2005-2006.
Population: West Virginians age 18 and older with current asthma.
Routine Visit = Responded "1 or more times" to "During the past 12 months, how many times did you see a doctor, nurse, or other health professional for a routine checkup for your asthma?"
Sick Visit = Responded "1 or more times" to "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?" Does not include emergency room visits.
ER Visit = Responded "1 or more times" to "During the past 12 months, how many times did you visit an emergency room or urgent care center because of your asthma?"

Figure 3.6
West Virginia Asthma Hospitalizations



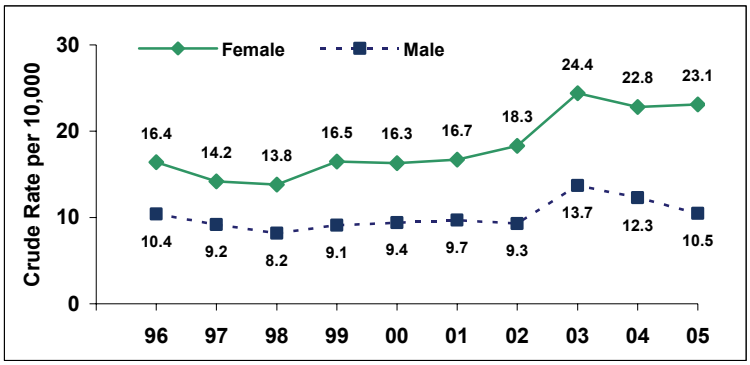
Data Source: West Virginia Health Care Authority.
Population: West Virginia residents.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

Figure 3.7
Asthma Hospitalization Rates



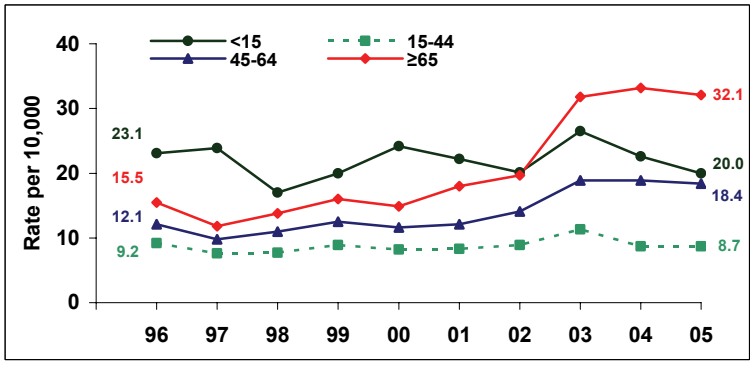
Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center; National Hospital Discharge Survey annual reports.
Population: West Virginia and United States residents.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

Figure 3.8
Asthma Hospitalization Rates by Gender



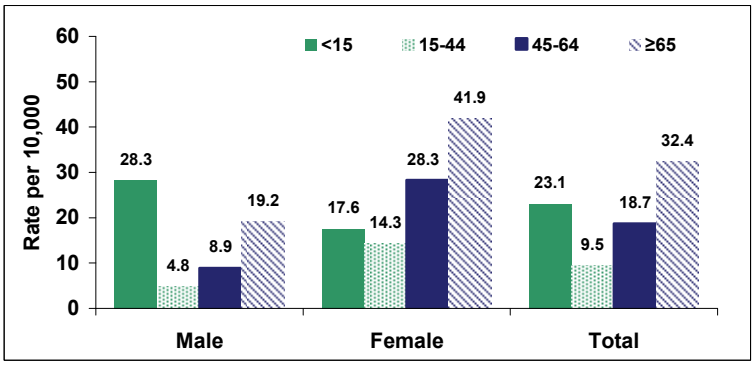
Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center.
Population: West Virginia residents.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.
Note: Age-adjusted rates are presented in Appendix D.

Figure 3.9
Asthma Hospitalization Rates by Age



Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center.
Population: West Virginia residents.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

Figure 3.10
Asthma Hospitalizations by Gender & Age, 2003-2005



Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center.
Population: West Virginia residents.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

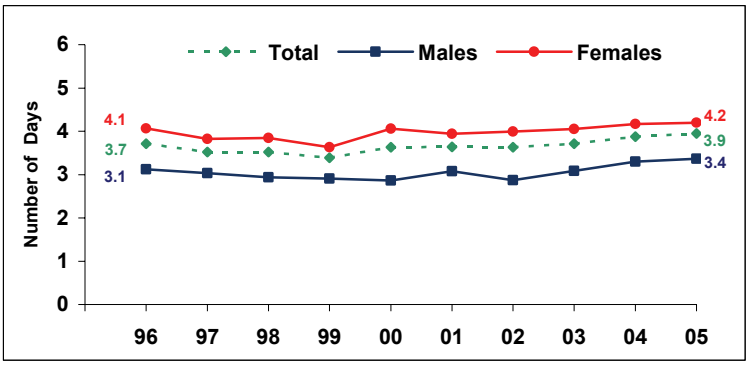
KEY FINDINGS - INPATIENT HOSPITALIZATIONS

- *In the United States and West Virginia, females are more likely than males to be hospitalized due to asthma. In 2005, the asthma hospitalization rate was more than two times higher among West Virginia females than males.*
- *Between 1996 and 2005, the gender difference in the rate of asthma hospitalizations increased in West Virginia but not the United States. In 1996, the asthma hospitalization rate was 58% higher among West Virginia females than males; by 2005, the rate was 120% higher among females.*
- *Historically, in the United States and West Virginia, the rate of asthma hospitalizations has been highest among children under the age of 15. However, since 2003, the elderly have had the highest asthma hospitalization rate in West Virginia.*
- *Between 1996 and 2005, the rate of asthma hospitalizations more than doubled among West Virginians aged 65 and older.*
- *The age trend in asthma hospitalizations differs by gender. Whereas the asthma hospitalization rate is highest among females at age 65+, the rate is highest among males in childhood. In fact, childhood is the only age in which males have a higher asthma hospitalization rate than females.*

KEY FINDINGS - INPATIENT HOSPITALIZATIONS

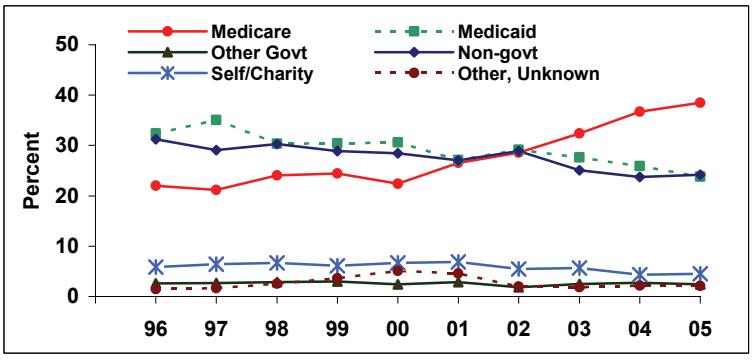
- *On average, in 2005 West Virginians hospitalized with a primary diagnosis of asthma spent 3.9 days in the hospital, compared with 3.3 days nationwide.*
- *The average length of stay for asthma hospitalizations is higher for females than males in both West Virginia and the United States.*
- *Charges for asthma hospitalizations in West Virginia increased from $10.3 million in 1996 to $23.2 million in 2005. In 2005, charges for asthma hospitalizations averaged $7,545 per hospitalization and $1,912 per day.*
- *A primary payor is the expected main source of payment for a hospitalization. From 1996 to 2002, Medicaid and non-government insurers were the two most common payors for asthma hospitalizations in West Virginia. Since 2003, Medicare has been the most common payor of asthma hospitalizations (having been charged for more than one-third of asthma hospitalizations in the state).*
- *In 2005, more than 30% of asthma hospitalizations were charged to Medicaid, other government programs, or were not covered by any insurer (self-pay/charity).*

Figure 3.11
Average Length of Stay of Asthma Hospitalizations



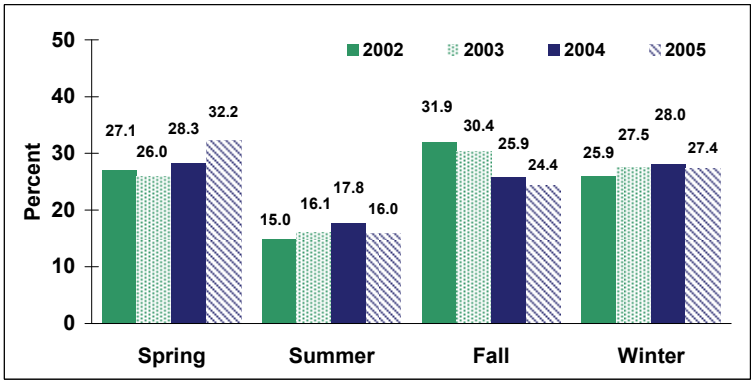
Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center.
Population: West Virginia residents.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

Figure 3.12
Asthma Hospitalizations by Primary Payor



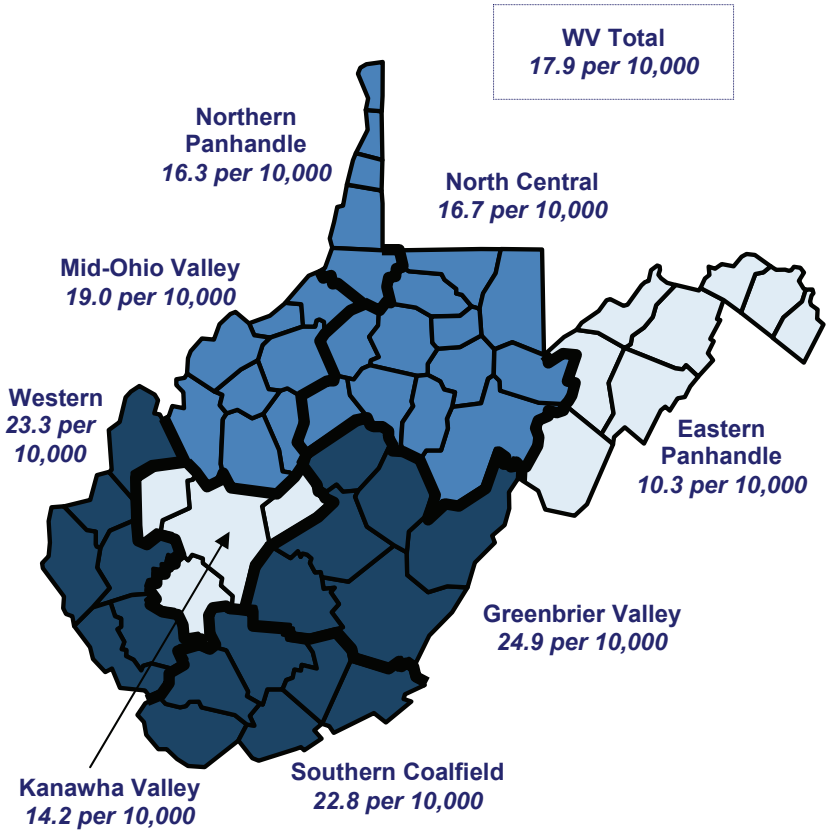
Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center.
Population: West Virginia residents.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

Figure 3.13
Asthma Hospitalizations by Season of Discharge



Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center.
Population: West Virginia residents.
Spring = March, April, or May; Summer = June, July, or August; Fall = September, October, or November; Winter = December, January, or February.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

Figure 3.14
Average Annual Asthma Hospitalization Rates* by Region, 2003-2005



Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center.
Population: West Virginia residents.
* Crude rate per 10,000.
Asthma Hospitalizations = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.
Regional age-adjusted rates and a listing of the counties within each region are presented in Appendix D.

KEY FINDINGS - INPATIENT HOSPITALIZATIONS

- *Asthma hospitalizations are less common in the summer than in the spring, fall, and winter. In 2005, nearly one-third of asthma hospitalizations occurred in the spring (i.e., March, April, or May).*
- *Between 2003 and 2005, there was an average of 17.9 asthma hospitalizations per 10,000 population each year.*
- *The average annual asthma hospitalization rate was highest in the Greenbrier Valley, Southern Coalfield, and Western regions and lowest in the Eastern Panhandle and Kanawha Valley regions.*

4. ASTHMA IN WV MEDICAID & CHIP

West Virginia Medicaid and CHIP Defined

The West Virginia Medicaid program provides health care coverage to low-income adults and children. The West Virginia Children's Health Insurance Program (CHIP) provides coverage to uninsured children who are not eligible to receive coverage through the Medicaid program. These children are in families whose incomes are too high to qualify for Medicaid, but are less than twice that of the current Federal Poverty Level (24).

Medicaid and CHIP recipients are of particular interest to public health programs because many health conditions, including asthma, are inversely associated with socioeconomic indicators such as income. That is, individuals with low levels of income are more likely to have chronic health conditions. In fact, West Virginia adults with an annual income less than $25,000 are significantly more likely to have asthma than those with an income of $50,000 or more (source: Behavioral Risk Factor Survey, 2002-2005, see Chapter 1). In addition, the prevalence of asthma is nearly twice as high among West Virginia children who have health care coverage through CHIP or Medicaid than children with private health insurance (15.0% vs. 8.0%; source: National Survey of Children's Health, 2003).

West Virginia Medicaid and CHIP Data

West Virginia public health programs are working to reduce socioeconomic disparities related to chronic disease and access to health care. The first step is to identify and understand the burden of disease among West Virginians of low socioeconomic status. Therefore, the West Virginia Asthma Education and Prevention Program funded projects headed by Michael Smith, PhD, RPh, at the West Virginia University School of Pharmacy to analyze West Virginia Medicaid fee-for-service claims data and West Virginia CHIP claims data to determine:

- The prevalence of asthma in the Medicaid and CHIP populations.
- Asthma-related medical services and prescription utilization among Medicaid and CHIP recipients.
- The amount reimbursed for asthma-related services and prescriptions by Medicaid and CHIP.

Claims data are administrative data used for billing purposes. They provide information on all medical services and prescriptions billed to Medicaid and CHIP for reimbursement. Disease conditions are identified by analyzing medical services diagnosis codes and prescription claims. Recipients were identified as having asthma if they had at least one medical service claim (office/clinic, ER, or hospital) with a primary or secondary diagnosis of asthma (ICD-9 CM codes 493.00-493.99), or at least two prescription claims for asthma-related drugs, of which at least one was for a drug other than an oral steroid. Oral steroids are used to treat many conditions other than asthma. Therefore, if a recipient had a claim for an oral steroid, he/she must also have had an asthma-related prescription claim for a medication in another pharmacotherapy class to be classified as having asthma.

The definition used to identify recipients with asthma is based on modified criteria of the National Committee for Quality Assurance (NCQA). It is important to note that this methodology may overestimate the prevalence of asthma, asthma-related medical service and prescription use, and asthma-related costs to Medicaid and CHIP. For example, medical service claims with only a secondary diagnosis of asthma are included in the rates presented in this chapter, although the primary reason for obtaining treatment may be unrelated to asthma. See Appendix A for a discussion of additional strengths and limitations of Medicaid and CHIP claims data.

This Chapter

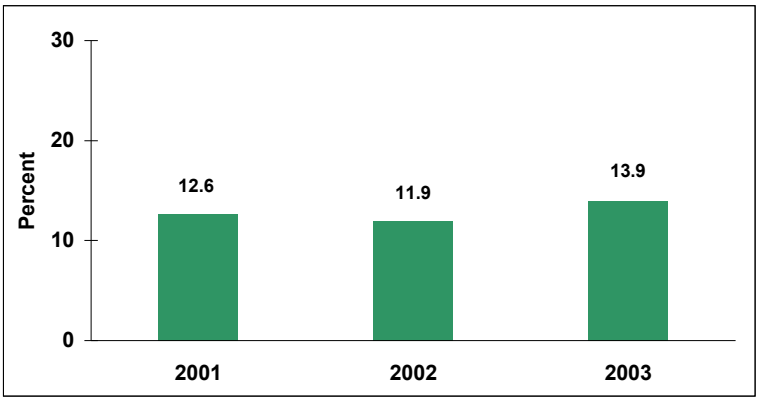
This chapter compiles results of the four separate analyses conducted by Michael Smith, PhD, RPh, at the West Virginia University School of Pharmacy. Presented are results related to asthma prevalence, asthma-related medical services use, and asthma-related reimbursements from 2001, 2002, and 2003 Medicaid fee-for-service claims data and 2005 CHIP claims data. The denominator for Medicaid prevalence rates is the number of recipients of West Virginia Medicaid during the corresponding fiscal year. The denominator for CHIP prevalence rates is the number of persons enrolled in West Virginia CHIP at any time during fiscal year 2005. These results are presented in more detail in Health Statistics Center Statistical Briefs No. 12, No. 18, No. 19, and No. 20. Health Statistics Center Briefs can be accessed online at: www.wvdhhr.org/bph/oehp/hsc.

4. ASTHMA IN WV MEDICAID & CHIP

KEY FINDINGS - MEDICAID

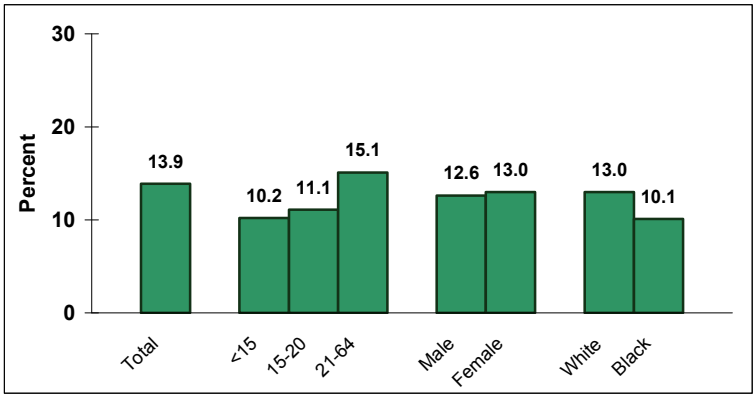
- *Between 2001 and 2003, the total number of Medicaid recipients increased from 344,296 to 366,987. In addition, the number of recipients with asthma increased from approximately 43,500 in 2001 to more than 51,000 in 2003.*
- *The percentage of Medicaid recipients who had asthma increased from 12.6% in 2001 to 13.9% in 2003.*
- *In 2001, 2002, and 2003 the prevalence of asthma was:*
  - *Higher among recipients aged 21 to 64 than those under the age of 15 and those aged 15 to 20.*
  - *Slightly higher among females than males.*
  - *Higher among whites than blacks.*
- *Between 2001 and 2003, the prevalence of asthma remained stable among most age, gender, and race groupings. Recipients 15 to 20 years old experienced the greatest increase in asthma prevalence, from 8.0% in 2001 to 11.1% in 2003.*

Figure 4.1
Asthma Prevalence Among Medicaid Recipients



Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients.
See Page 33 for the methodology used to identify recipients with asthma.

Figure 4.2
Asthma Prevalence Among Medicaid Recipients, 2003



Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients.
See Page 33 for the methodology used to identify recipients with asthma.
Note: The rate for recipients age 65 and older is not reliable due to possible misclassification of asthma with other respiratory diseases and due to the impact of Medicare penetration in this age group and is therefore not presented.

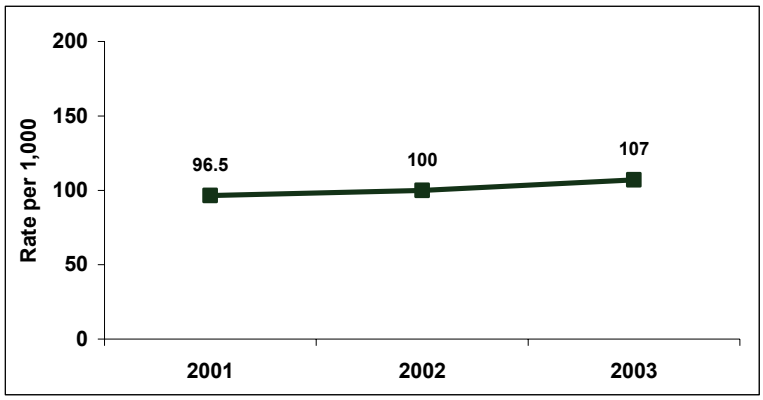
4. ASTHMA IN WV MEDICAID & CHIP

Table 4.1
Asthma Medical Services among Medicaid Recipients

Year		Office Visits	ER Visits	Hospitalizations
2001	Visits	33,226	5,103	1,394
	Recipients	13,754	4,029	1,205
2002	Visits	35,723	5,642	1,702
	Recipients	14,655	4,365	1,442
2003	Visits	39,185	6,517	2,189
	Recipients	16,211	5,066	1,799

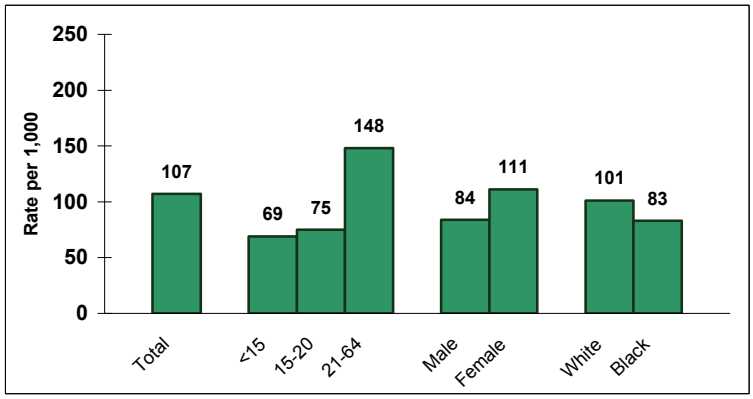
Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients.
Office/Clinic Visits, ER Visits, Hospitalizations = Services with a primary or secondary diagnosis of asthma.

Figure 4.3
Asthma Office Visits Among Medicaid Recipients



Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients.
Asthma Office Visits = Office/clinic visits with a primary or secondary diagnosis of asthma.

Figure 4.4
Asthma Office Visits, Medicaid Recipients, 2003



Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients.
Asthma Office Visits = Office/clinic visits with a primary or secondary diagnosis of asthma.
Note: The rate for recipients age 65 and older is not reliable due to possible misclassification of asthma with other respiratory diseases and due to the impact of Medicare penetration in this age group and is therefore not presented.

KEY FINDINGS - MEDICAID

Office/clinic visits are integral to proper asthma management. However, ER visits and hospitalizations with a primary diagnosis of asthma are indicators of poor disease management and uncontrolled asthma.

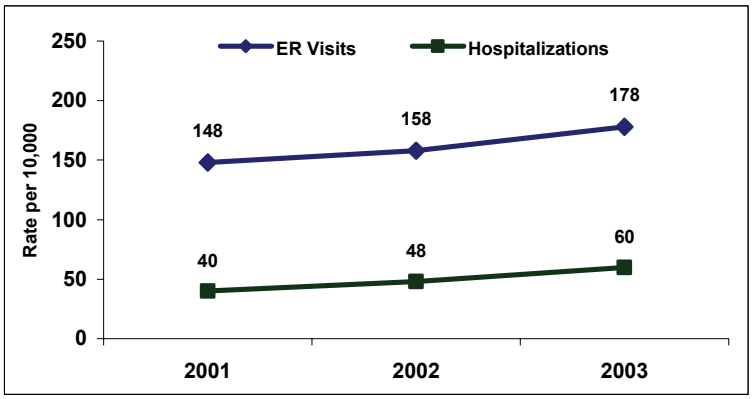
- *Between 2001 and 2003, the number of asthma-related office/clinic visits, ER visits, and hospitalizations increased among West Virginia Medicaid recipients. In addition, the number of recipients using medical services for asthma-related illnesses also increased.*
- *Between 2001 and 2003, the rate of asthma-related office/clinic visits and the rate of recipients visiting a doctor's office for asthma-related services increased. Each year, there were approximately 100 asthma-related office/clinic visits per every 1,000 Medicaid recipients. Among every 1,000 recipients, more than 40 of them visited the doctor for asthma-related services.*
- *In 2001, 2002, and 2003 the rate of asthma-related office/clinic visits was:*
  - *Higher among recipients aged 21 to 64 than those under the age of 15 and those aged 15 to 20.*
  - *Higher among females than males.*
  - *Higher among whites than blacks.*

4. ASTHMA IN WV MEDICAID & CHIP

KEY FINDINGS - MEDICAID

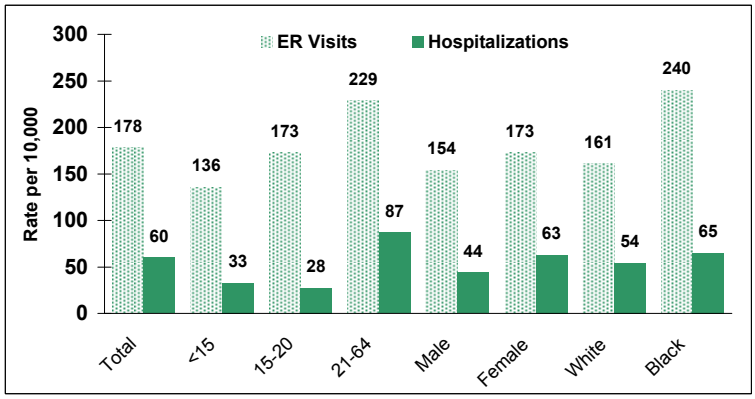
- *The rate of asthma-related hospitalizations increased 50% and the asthma-related ER visit rate increased 20.3% between 2001 and 2003. During this same time, the rate of asthma-related office/clinic visits increased 10.9%.*
- *In 2001, 2002, and 2003 the rates of asthma-related ER visits and hospitalizations were:*
  - *Higher among recipients aged 21 to 64 than those under the age of 15 and those aged 15 to 20.*
  - *Higher among females than males.*
  - *Higher among blacks than whites.*
- *Although the prevalence of asthma was only slightly higher among females than males, females had substantially higher rates of asthma-related office/clinic visits, ER visits, and hospitalizations than males.*
- *Whites had a higher prevalence of asthma and a higher rate of asthma-related office/clinic visits than blacks, while blacks had higher rates of asthma-related ER visits and hospitalizations.*

Figure 4.5
Asthma Acute Care Visits Among Medicaid Recipients



Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients.
ER Visits = Emergency room visits with a primary or secondary diagnosis of asthma.
Hospitalizations = Hospitalizations with a primary or secondary diagnosis of asthma.

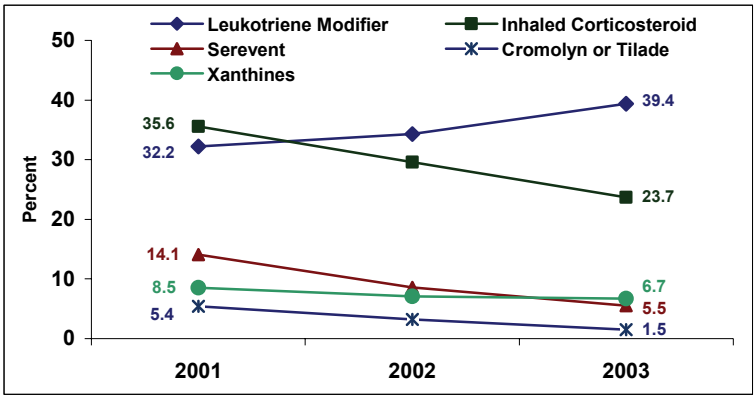
Figure 4.6
Asthma Acute Care Visits, Medicaid Recipients, 2003



Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients.
ER Visits = Emergency room visits with a primary or secondary diagnosis of asthma.
Hospitalizations = Hospitalizations with a primary or secondary diagnosis of asthma.
Note: The rates for recipients age 65 and older are not reliable due to possible misclassification of asthma with other respiratory diseases and due to the impact of Medicare penetration in this age group and are therefore not presented.

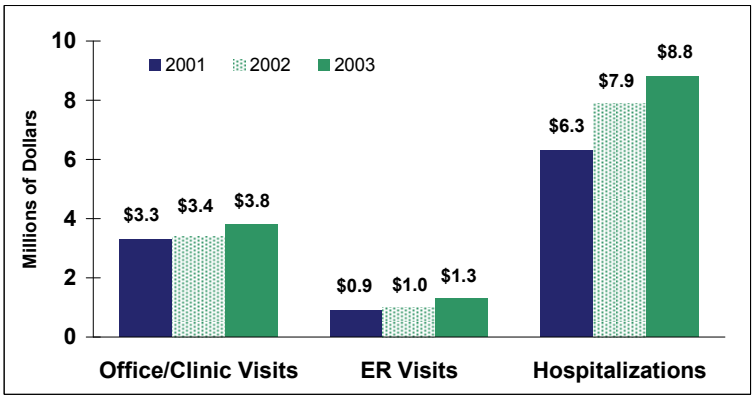
4. ASTHMA IN WV MEDICAID & CHIP

Figure 4.7
Asthma Controller Medication, Medicaid Recipients



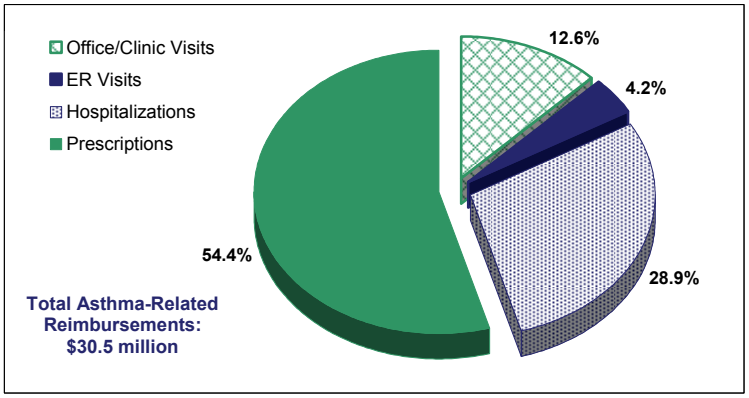
Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients who had at least one medical claim with a primary or secondary diagnosis of asthma and at least one prescription claim for an asthma-related medication.
Note: Percentages do not sum to 100%. Quick-relief medications are not included in this graph. Recipients could have claims in more than one pharmacotherapeutic category.

Figure 4.8
Total Medicaid Reimbursements for Asthma Services



Data Source: West Virginia Medicaid fee-for-service claims data.
Population: West Virginia Medicaid recipients.
Office/Clinic Visits, ER Visits, Hospitalizations = Services with a primary or secondary diagnosis of asthma.
Note: Reimbursements for office/clinic and ER visits are based on amounts paid recorded in the Medicaid claims data. Hospitalization reimbursements are estimated based on average diagnosis related group (DRG) reimbursement rates.

Figure 4.9
Distribution of Medicaid Asthma Reimbursements, 2003



Data Source: West Virginia Medicaid fee-for-service claims data.
Office Visits, ER Visits, Hospitalizations = Services with a primary or secondary asthma diagnosis.

KEY FINDINGS - MEDICAID

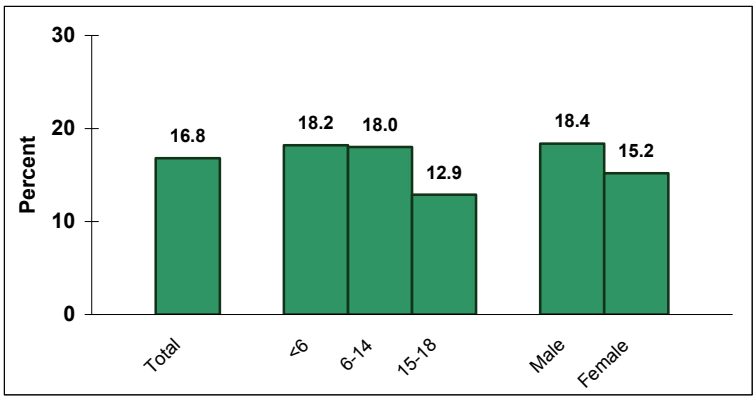
- *Quick-relief medications are used to relieve symptoms during an asthma attack. In the years 2001 through 2003, more than 80% of Medicaid recipients with asthma who filled an asthma-related prescription received some type of short-acting beta-agonist, the most common class of quick-relief medications.*
- *Long-term controller medications are used to prevent asthma attacks from occurring. Inhaled corticosteroids and leukotriene modifiers are considered first-line treatment medications for patients with persistent asthma. Between 2001 and 2003, the percentage of recipients with asthma who filled a prescription for an inhaled corticosteroid decreased, while the percentage who filled a prescription for a leukotriene modifier increased.*
- *The total amount reimbursed by Medicaid for asthma-related medical services and prescriptions increased from $25.2 million in 2001 to $30.5 million in 2003. This equals an average of $598 per recipient with asthma in 2003.*
- *In 2003, Medicaid reimbursed an average of $4,034 for every asthma-related hospitalization, $195 for every ER visit, and $98 for every office visit. A large portion of the increase in dollars reimbursed for asthma-related medical services is due to an increase in hospitalizations.*

4. ASTHMA IN WV MEDICAID & CHIP

KEY FINDINGS - CHIP

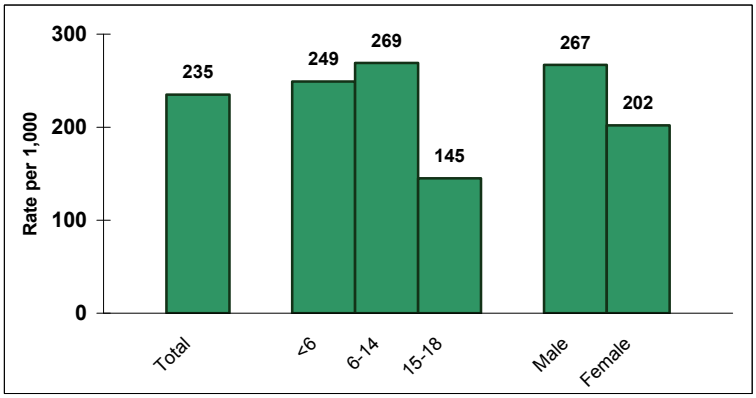
- *In 2005, 16.8% of West Virginia CHIP enrollees had asthma. This equals 4,086 of the 24,318 CHIP enrollees.*
- *The prevalence of asthma was highest among CHIP enrollees under the age of 6, those 6 to 14 years old, and males.*
- *In 2005, there were 5,725 office/clinic visits, 455 ER visits, and 65 hospitalizations for asthma-related illnesses among CHIP enrollees.*
- *The rate of asthma-related office/clinic visits was much lower among CHIP enrollees 15 to 18 years old than younger enrollees.*
- *Enrollees under the age of 6 had a much higher rate of asthma-related hospitalizations than older enrollees.*
- *The rates of asthma-related office/clinic visits, ER visits, and hospitalizations were higher among males than females.*

Figure 4.10
Asthma Prevalence Among CHIP Enrollees, 2005



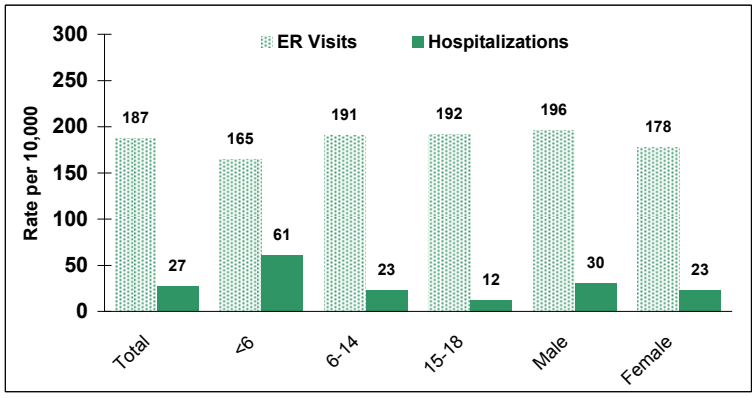
Data Source: West Virginia CHIP claims data.
Population: West Virginia CHIP enrollees during calendar year 2005.
See Page 33 for the methodology used to identify recipients with asthma.

Figure 4.11
Asthma Office Visits Among CHIP Enrollees, 2005



Data Source: West Virginia CHIP claims data.
Population: West Virginia CHIP enrollees during calendar year 2005.
See Page 33 for the methodology used to identify recipients with asthma.
Asthma Office Visits = Office/clinic visits with a primary or secondary diagnosis of asthma.

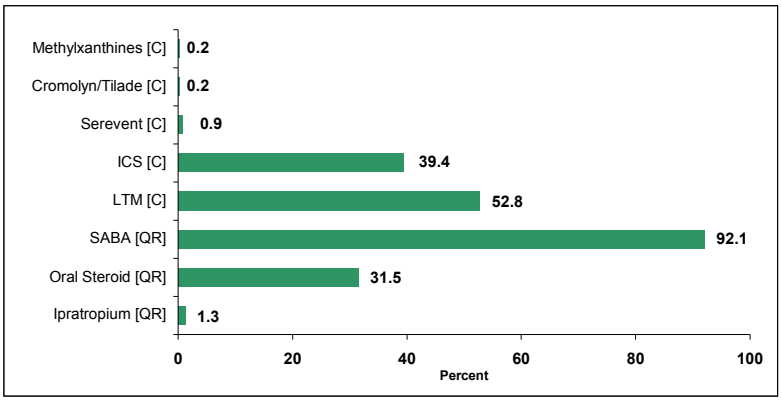
Figure 4.12
Asthma Acute Care Visits, CHIP Enrollees, 2005



Data Source: West Virginia CHIP claims data.
Population: West Virginia CHIP enrollees during calendar year 2005.
ER Visits = Emergency room visits with a primary or secondary diagnosis of asthma.
Hospitalizations = Hospitalizations with a primary or secondary diagnosis of asthma.

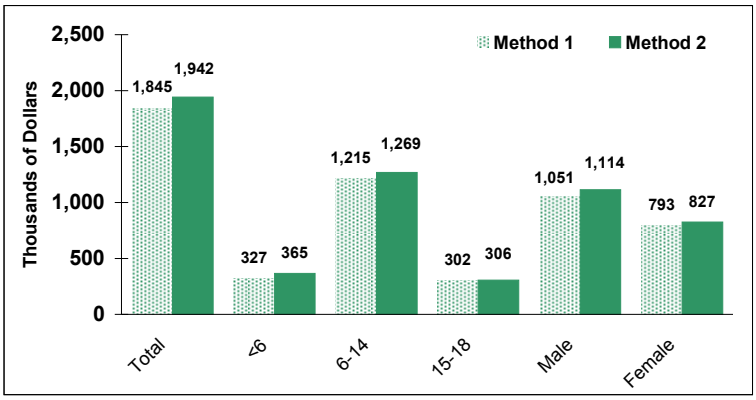
4. ASTHMA IN WV MEDICAID & CHIP

Figure 4.13
Asthma Medication Use, CHIP Enrollees with Asthma



Data Source: West Virginia CHIP claims data.
Population: West Virginia CHIP enrollees who had at least one medical claim with a primary or secondary diagnosis of asthma and at least one prescription claim for an asthma-related medication (N=2,218).
ICS = Inhaled corticosteroids.
LTM = Leukotriene modifiers.
SABA = Short-acting beta-agonists (all dosage forms).
[C] = Asthma controller medication.
[QR] = Asthma quick-relief medication.
Note: Percents sum to more than 100% due to recipients who had claims in more than one pharmacotherapeutic category.

Figure 4.14
Total CHIP Reimbursements for Asthma Services



Data Source: West Virginia CHIP claims data.
Population: West Virginia CHIP enrollees during calendar year 2005.
Method 1 = Based on reimbursements recorded in the CHIP claims data.
Method 2 = Office/clinic visits, ER visits, and prescription medication reimbursements are based on amounts paid recorded in the CHIP claims data. Hospitalization reimbursements are estimated based on average diagnosis related group (DRG) reimbursement rates.
Note: Two different methods were used to estimate the reimbursements paid by CHIP for asthma-related hospitalizations during calendar year 2005. The total asthma reimbursements presented in this graph represent the two different methods used to calculate reimbursements for asthma hospitalizations.

KEY FINDINGS - CHIP

- *In 2005, CHIP recipients with asthma (i.e., had a medical service visit with a primary or secondary diagnosis of asthma) filled 11,089 prescriptions for asthma-related drugs – an average of 4.1 prescriptions per recipient with asthma.*
- *Quick-relief medications are used to relieve symptoms during an asthma attack. In 2005, 92.1% of recipients with asthma who filled an asthma-related prescription had received some type of short-acting beta-agonist, the most common class of quick-relief medications.*
- *Long-term controller medications are used to prevent asthma attacks from occurring. Inhaled corticosteroids and leukotriene modifiers are considered first-line treatment medications for patients with persistent asthma. In 2005, 39.4% of recipients with asthma who filled an asthma-related prescription received an inhaled corticosteroid and 52.8% received a leukotriene modifier.*
- *CHIP reimbursed more than $1.8 million for asthma-related services in 2005. This equals between approximately $450 and $475 per recipient with asthma.*
- *For asthma-related services, CHIP reimbursed an average of $95 per office/clinic visit, $267 per ER visit, and between $1,331 and $2,816 per hospitalization.*

5. ASTHMA SCHOOL HEALTH SERVICES

School Health Services Defined

The West Virginia Department of Education, Office of Healthy Schools is responsible for coordinating health care services for public school students. The Office of Healthy Schools mission is to provide leadership, training, and support for schools and their communities designed to improve collaboration and ensure the health and educational achievement of children in a safe, nurturing, and disciplined environment.

School health services are primarily provided by school nurses. School nurses monitor student health and provide and coordinate health services to support and sustain school attendance. Some of their major responsibilities include: organizing health screenings; maintaining communication with parents, school staff, physicians, school-based health centers, and public agencies regarding student health; providing individual health counseling and staff development; and developing health care plans to manage special health care needs for students with chronic conditions to ensure that all school personnel have the information and/or training needed to provide the individualized medically ordered services necessary to care for each student. During the 2006-2007 school year, 243 school nurses provided services to more than 280,000 students in 753 West Virginia public schools.

Asthma-related school health services are typically related to the coordination and monitoring of asthma inhalers. The West Virginia Asthma Coalition was instrumental in the successful passage of 2003 legislation allowing students to carry and self-administer their asthma rescue inhalers while in school. School nurses are responsible for granting this permission to students if they have a physician's order for a rescue inhaler, have permission from a parent/guardian, and pass an assessment by the school nurse.

School Health Services Data

West Virginia Code §18-5-22 requires the employment of school nurses and the formation of a Council of School Nurses. Each county school nurse is required to periodically perform a needs assessment. These data are compiled at the county level, collected by the Council of School Nurses, and sent to the Office of Healthy Schools for analysis and compilation into a report. The School Nurse Needs Assessment collects data on school nurse professional preparation, school health services, health cases requiring involvement of school nurses, and the number of students requiring specialized health care procedures. The data reflect the health status of West Virginia students and are used to determine which essential services are being provided to students.

In 2006 and 2007, the Office of Healthy Schools received supplemental funding of $1 million from the legislature for school health services. It was decided that these funds would be distributed to counties based on the number and type of health care procedures being administered by school nurses. Ten health care procedures, representing a range of complexity, were chosen: insulin injection, insulin pump, rectal valium, vagal nerve stimulator, mechanical ventilator, metered-dose inhaler, tracheotomy care, tracheotomy replacement, sterile suction, and sterile catheterization. In Fall 2006, the Office of Healthy Schools implemented an Electronic Health Record to assist school nurses with the documentation of these 10 physician-ordered procedures and the development of health care plans for students with asthma, diabetes, seizures, and other chronic conditions who require these procedures. To be eligible for supplemental funding, counties reported this information to the Office of Healthy Schools. In the future, the Electronic Health Record will be expanded to include all health conditions and all procedures performed by school nurses.

The School Nurse Needs Assessment and the Electronic Health Record are the most complete data sources available for determining the prevalence and burden of asthma in West Virginia schools. See Appendix A for a discussion of the strengths and limitations of these data sources. Currently, complete statewide data on the number and characteristics of students with asthma, asthma-related school absences, and the implementation of the asthma inhaler self-medication law are not available.

This Chapter

This chapter presents data on asthma cases, asthma health care plans, and physician-ordered asthma inhalers in West Virginia public schools. Data presented are from the 1997-1998, 1999-2000, 2002-2003, and 2004-2005 School Nurse Needs Assessment Reports and the Electronic Health Record system from August 2006 – March 26, 2007.

5. ASTHMA SCHOOL HEALTH SERVICES

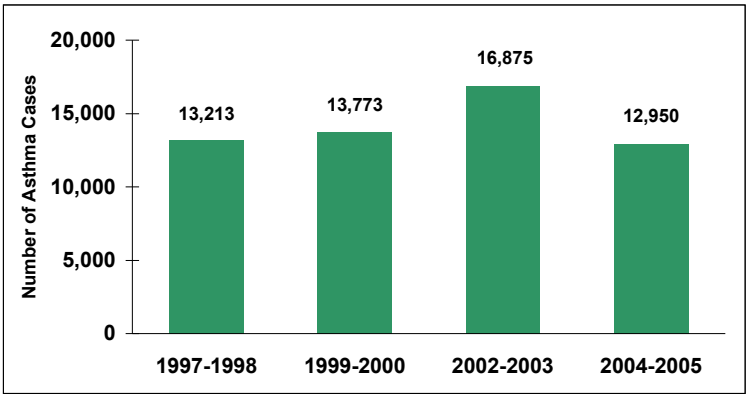
KEY FINDINGS

- *In the 2004-2005 school year, asthma was the leading health condition requiring school nurse involvement, intervention, or follow-up. There were nearly 13,000 asthma cases in public schools, accounting for 21% of the 62,000 school nurse cases that year.*

- *More asthma cases requiring school nurse involvement occur among students in grades PreK-4 than among older students. In 2004-2005, 43.4% of the asthma cases occurred among students in grades PreK-4; only 23.7% occurred among students in grades 9-12.*

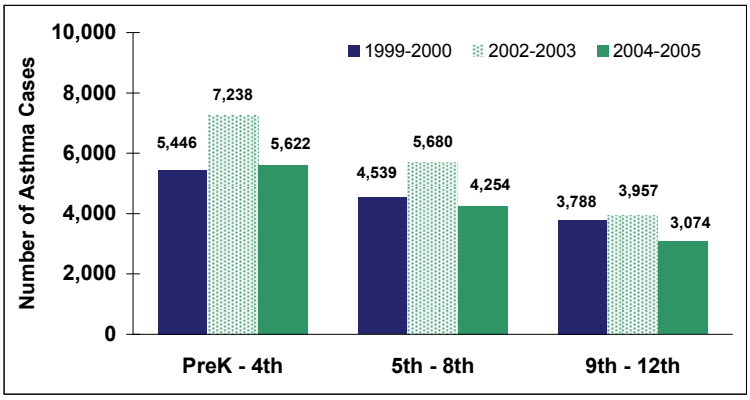
- *In 2004-2005, approximately 4,000 public school students had a physician's order for use of an asthma rescue inhaler at school. This equals approximately 1.4% of students.*

Figure 5.1
Asthma Cases Requiring School Nurse Involvement



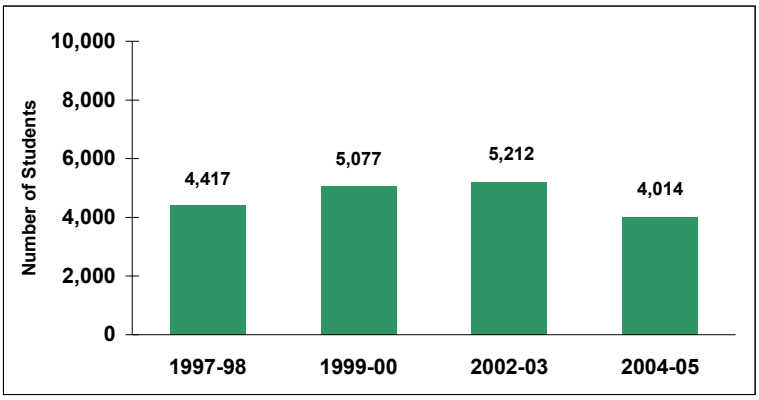
Data Source: West Virginia School Nurse Needs Assessment Reports, West Virginia Department of Education.
Population: West Virginia public school students.
Note: Data may be incomplete. Not all school districts reported data.

Figure 5.2
Asthma Cases Involving School Nurses by Grade



Data Source: West Virginia School Nurse Needs Assessment Reports, West Virginia Department of Education.
Population: West Virginia public school students.
Note: Data may be incomplete. Not all school districts reported data.

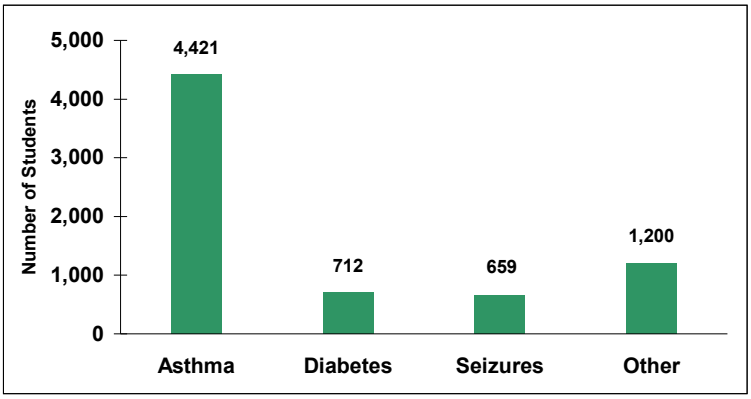
Figure 5.3
Students with a Provider Order for an Asthma Inhaler



Data Source: West Virginia School Nurse Needs Assessment Reports, West Virginia Department of Education.
Population: West Virginia public school students.
Note: Data may be incomplete. Not all school districts reported data.

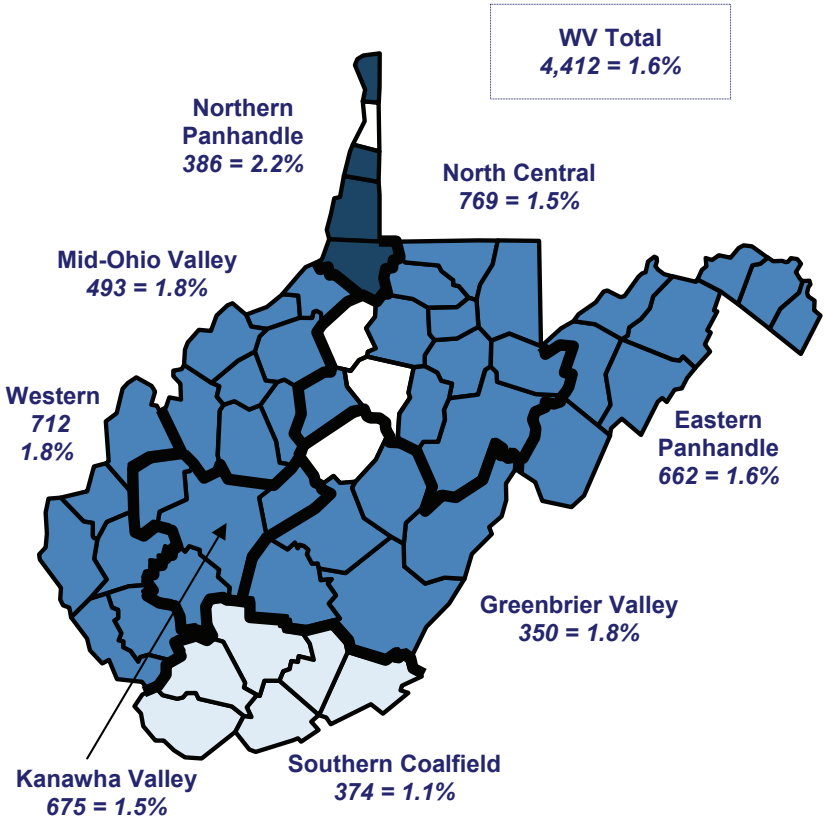
5. ASTHMA SCHOOL HEALTH SERVICES

Figure 5.4
Electronic Health Care Plans, 2006-2007



Data Source: Electronic Health Record as of March 26, 2007, West Virginia Department of Education.
Population: West Virginia public school students.
Note: Data may be incomplete. Not all school districts reported data.

Figure 5.5
Asthma Electronic Health Care Plans, 2006-2007



Data Source: Electronic Health Record System as of March 26, 2007, West Virginia Department of Education.
Population: West Virginia public school students.
Note: Data may be incomplete. Counties with no shading did not report any data. These counties were excluded when calculating percentages.

KEY FINDINGS

School nurses are required to develop health care plans for students who have a physician's order for specialized health care at school.

- *Between August 2006 and March 2007, 4,823 students had a physician's order for at least 1 of 10 specialized health care procedures tracked by the Electronic Health Record; 81.6% (3,935) of these students had a physician's order for an asthma inhaler.*
- *Between August 2006 and March 2007, school nurses completed electronic asthma health care plans for 4,421 students requiring specialized asthma care. This compares with plans for 712 students with diabetes, 659 with seizures, and 1,200 with some other condition requiring specialized health care.*
- *The percentage of students who have an electronic health care plan for asthma is highest in the Northern Panhandle (2.2%) and lowest in the Southern Coalfield region (1.1%).*

6. OCCUPATIONAL ASTHMA

Occupational Asthma Defined

Occupational asthma is defined as a reversible, generalized airway narrowing as a result of exposure to airborne dust, gases, vapors, or fumes in the work environment (25). Asthma symptoms may develop for the first time or pre-existing asthma may be aggravated by exposures within the workplace. The American Thoracic Society estimates that approximately 15% of asthma in the adult population is attributable to occupational exposure (25). An estimated 11 million workers in a wide range of industries and occupations are potentially exposed to at least one of the numerous agents known to be associated with the development of occupational asthma (26).

There are many agents in the workplace that can cause occupational asthma (27). These include:

- Chemical dusts or vapors from plasticizers, polyurethane paints, insulation, foam mattresses and upholstery, and packaging materials used in manufacturing and processing operations.
- Animal substances such as hair, dander, mites, small insects, and bacterial or protein dusts. At highest risk are farmers, animal handlers, shepherds, grooms, jockeys, veterinarians, and kennel workers.
- Organic dusts such as flour, cereals, grains, coffee and tea dust, and papain dust from meat tenderizer. At highest risk are millers, bakers, and other food processors.
- Cotton, flax, and hemp dust inhaled by workers in cotton processing and textile industries.
- Metals such as platinum, chromium, nickel sulfate, and soldering fumes. At highest risk are employees in refining and manufacturing operations.

Occupational asthma data can answer four important surveillance questions:

- How prevalent is occupational asthma in West Virginia?
- Which industries have the most workers' compensation claims for occupational asthma?
- What demographic characteristics are associated with occupational asthma claims?
- What are the medical and indemnity costs associated with occupational asthma?

Occupational Asthma Data

Data on occupational asthma in West Virginia are obtained from the workers' compensation claims database. This database contains information about claims of most work-related injuries and illnesses in the state. These data are analyzed and provided by the Institute of Occupational and Environmental Health at West Virginia University.

West Virginia has a state mandated workers' compensation insurance system, which provides payments for medical expenses and lost wages incurred by employees injured on the job. Most West Virginia employers are regular subscribers to the West Virginia workers' compensation fund. These employers are required to report all work-related injuries within five days. Since 2005, the workers' compensation fund has been managed by BrickStreet Insurance. Prior to 2005, the fund was managed by a state agency.

Occupational asthma claims are identified based on diagnosis codes submitted by health care providers for billing purposes. Claims with ICD-9-CM diagnosis codes 491.2, 491.21, 493.0, 493.1, 493.9, 495.8, 506.4, 506.9, and 507.8 are classified as occupational asthma claims. There are two types of workers' compensation claims: medical claims and indemnity claims. Medical claims are those that resulted in reimbursement for medical expenses associated with a work-related injury. Indemnity claims are those that resulted in payments for lost wages and impairment as a result of disability from a work-related injury. See Appendix A for a discussion of the methodologies and limitations of workers' compensation data.

This Chapter

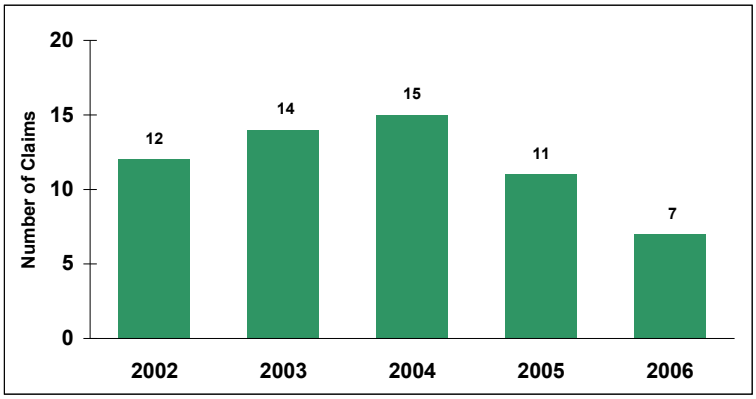
This chapter presents data on 2002-2006 workers' compensation claims for occupational asthma that have been approved by the West Virginia workers' compensation program. The data are presented by age, gender, industry, occupation, and nature and cause of accident.

6. OCCUPATIONAL ASTHMA

KEY FINDINGS

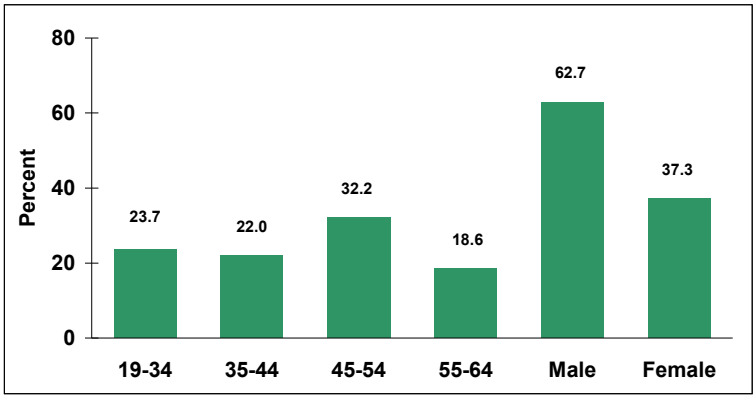
- *According to the 2006 Behavioral Risk Factor Survey, 11.9% of West Virginia adults had ever been diagnosed with asthma. Of these, 7.4% (95% CI: 4.9-10.0) had asthma that was caused or made worse by exposure to chemicals, smoke, fumes, or dust in their workplace. There was no gender difference in the prevalence of occupational asthma (Males: 7.8%, 95% CI: 3.3-12.2; Females: 7.2%, 95% CI: 4.2-10.3).*
- *Between 2002 and 2006, there were a total of 59 occupational asthma workers' compensation claims in West Virginia. Of these claims, 29 were medical-only claims, 15 were temporary total disability (TTD) claims, and 1 was a partial permanent disability (PPD) claim.*
- *Between 2002 and 2006, the 15 occupational asthma TTD claims resulted in 686 total days of missed work.*
- *Between 2002 and 2006, most occupational asthma claims were filed by males (62.7%). Nearly one-third (32.2%) were filed by West Virginians aged 45-54.*
- *Between 2002 and 2006, the highest number of occupational asthma claims occurred among workers in the services (23 claims) and manufacturing (10 claims) industries.*

Figure 6.1
Occupational Asthma Workers' Compensation Claims



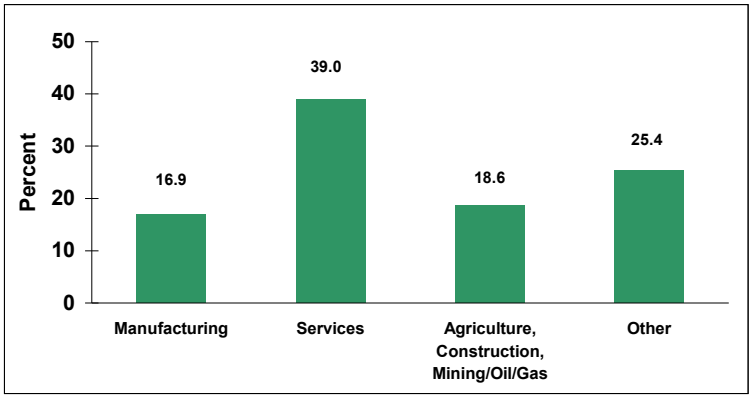
Data Source: West Virginia workers' compensation database, WVU Institute of Occupational and Environmental Health.

Figure 6.2
Occupational Asthma Claims by Age and Gender



Data Source: West Virginia workers' compensation database, WVU Institute of Occupational and Environmental Health.
Note: The age percents do not sum to 100%; 3.4% of claims had an unknown age.

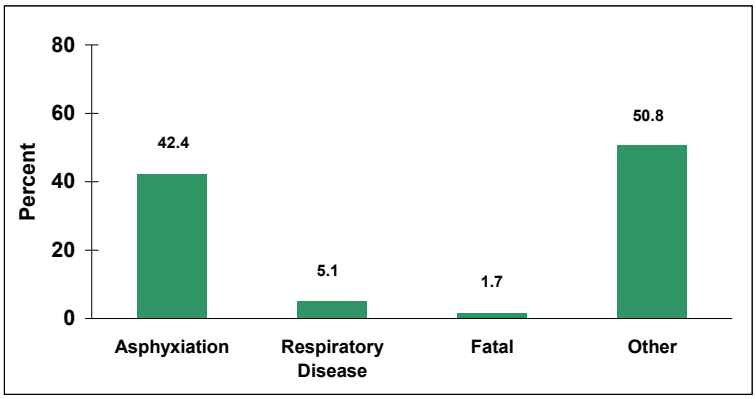
Figure 6.3
Occupational Asthma Claims by Industry, 2002-2006



Data Source: West Virginia workers' compensation database, WVU Institute of Occupational and Environmental Health.
Other = Education, Government, Retail Trade, Wholesale Trade, and Other.

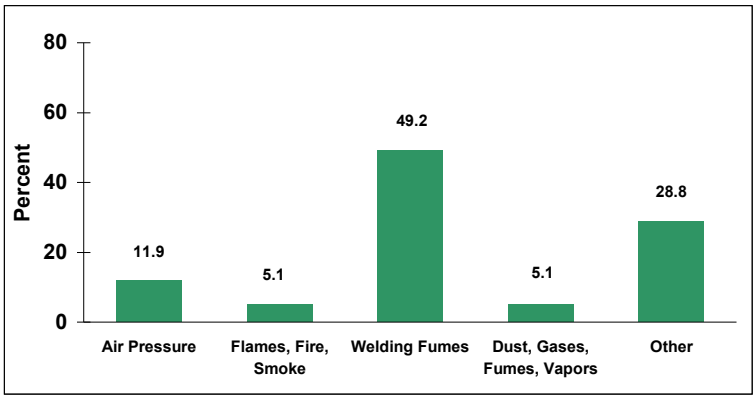
6. OCCUPATIONAL ASTHMA

Figure 6.4
Occupational Asthma Claims by Nature of Accident



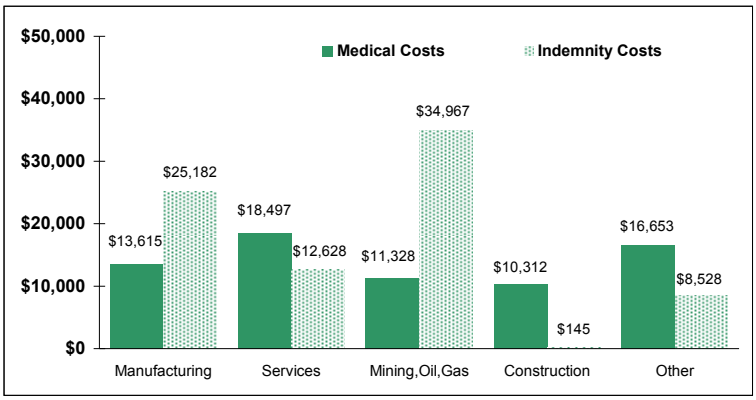
Data Source: West Virginia workers' compensation database, WVU Institute of Occupational and Environmental Health.

Figure 6.5
Occupational Asthma Claims by Cause of Accident



Data Source: West Virginia workers' compensation database, WVU Institute of Occupational and Environmental Health.

Figure 6.6
Occupational Asthma Costs by Industry, 2002-2006



Data Source: West Virginia workers' compensation database, WVU Institute of Occupational and Environmental Health.
Other = Agriculture, Education, Government, Retail Trade, Wholesale Trade, and Other.

KEY FINDINGS

- *More than 40% of occupational asthma cases in the years 2002-2006 were due to asphyxiation, including inhalation of gas and fumes. One occupational asthma case resulted in death.*
- *Nearly half (49.2%) of occupational asthma cases in the years 2002-2006 were caused by welding fumes.*
- *Between 2002 and 2006, West Virginia employees received $70,405 in medical payments and $81,450 in indemnity payments for occupational asthma claims.*
- *Between 2002 and 2006, the highest indemnity costs for occupational asthma occurred among workers in the mining, oil, and natural gas industry ($34,967) and the manufacturing industry ($25,182). These industries accounted for approximately 75% of the total indemnity costs but only about 25% of the total number of occupational asthma claims.*

7. ASTHMA MORTALITY

Asthma Mortality Defined

Asthma mortality, or death due to asthma, is a relatively rare occurrence. Although asthma is a chronic disease, proper management allows individuals with asthma to lead healthy, active lives. In fact, many people with asthma do not experience symptoms that limit their activities or lead to poor health. Nevertheless, more than 3,700 Americans died as a result of asthma complications in 2004 (9). Asthma mortality, like asthma acute care visits and hospitalizations, is often preventable. Asthma mortality data can answer three important surveillance questions:

- How many people die from asthma?
- How has asthma mortality changed over time?
- Does the asthma mortality rate differ by demographic characteristic?

Asthma Mortality Data

All states are required to collect and maintain mortality data for their state. This information is collected from death certificates and is reported to the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention (CDC). West Virginia death data are collected by the West Virginia Health Statistics Center's Vital Registration Office. The vital statistics database contains the following information for all deaths in West Virginia and for deaths of West Virginia residents that occur out of state: date of death, state of death, sex, age, date of birth, residence, marital status, educational attainment, ethnicity, race, occupation, and causes of death. U.S. death rates are obtained from the NCHS National Vital Statistics Reports (28) and the CDC online data query system, Wonder.

Cause of death is coded in vital statistics databases based on the International Classification of Disease (ICD). The ICD is periodically revised to update the classification system, add new diseases, and correct errors or inconsistencies. The implementation of new ICD versions often results in death codes that are not directly comparable between ICD versions. In fact, asthma deaths cannot be compared between ICD-9 (used from 1979 to 1998) and ICD-10 (implemented in 1999), due to changes in defining and coding asthma-related deaths. It is estimated that approximately 11% of the decline in asthma deaths between 1998 and 1999 is a product of the change from the ICD-9 to ICD-10 classification system (29).

Asthma deaths are defined as deaths with a primary diagnosis of asthma (ICD-9 codes 493 and ICD-10 codes J45-J46). See Appendix A for a discussion of the methodologies and limitations of mortality data.

This Chapter

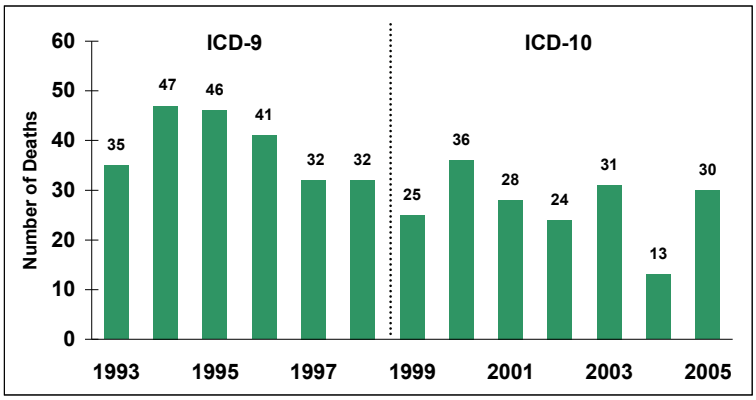
This chapter presents asthma mortality data for West Virginia residents by demographic characteristics known to be associated with asthma deaths (i.e., gender and age). The following figures include mortality rates per 100,000 population and 95% confidence intervals. Refer to Appendix C for a discussion of the methodologies used during analysis and interpretation.

7. ASTHMA MORTALITY

KEY FINDINGS

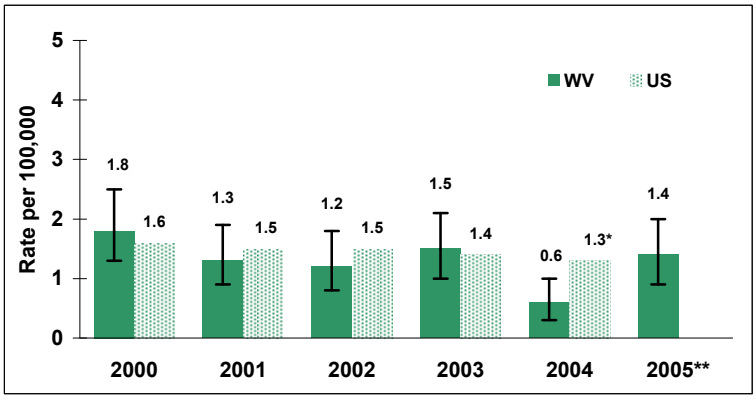
- *Since 1999, a total of 187 West Virginians have died from asthma. This is an average of 27 asthma deaths each year.*
- *The age-adjusted asthma mortality rate in West Virginia was 1.4 per 100,000 in 2005. Since 2000, this rate has remained relatively stable.*
- *There is no significant difference between the age-adjusted asthma mortality rates in West Virginia and the United States.*

Figure 7.1
Asthma Deaths



Population: West Virginia residents.
Data Source: West Virginia Vital Statistics.
Asthma Death = Death with a primary cause of asthma (ICD-10 J45-J46).
Note: Asthma deaths from 1993-1998 are not directly comparable to those from 1999-2005 due to differences between the ICD-9 and ICD-10 classification systems.

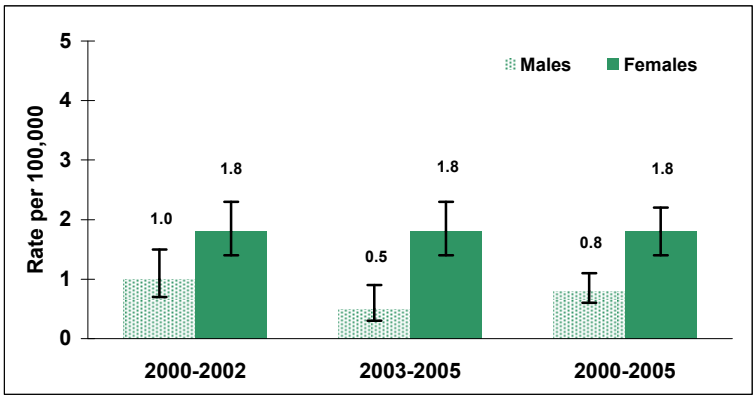
Figure 7.2
Age-adjusted Asthma Mortality Rates



Population: West Virginia and United States residents.
Data Sources: West Virginia Vital Statistics; NCHS National Vital Statistics Reports.
Asthma Death = Death with a primary cause of asthma (ICD-10 J45-J46).
* Preliminary 2004 US rate released by NCHS.
** US 2005 data not yet published.
Note: Confidence intervals are not available for US rates. They are not included in the NCHS National Vital Statistics Reports.

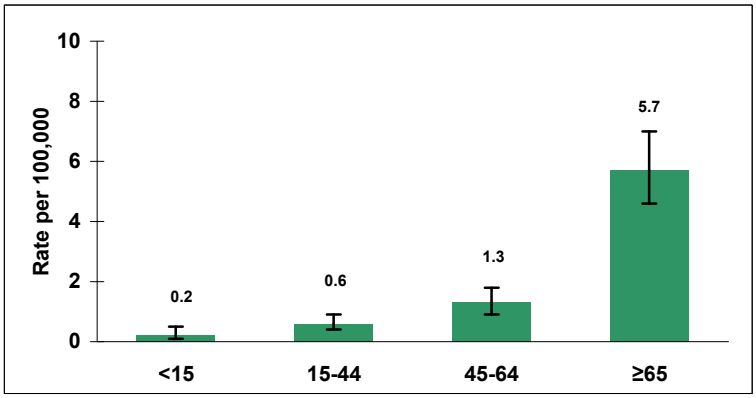
7. ASTHMA MORTALITY

Figure 7.3
Age-adjusted Asthma Mortality Rates by Gender



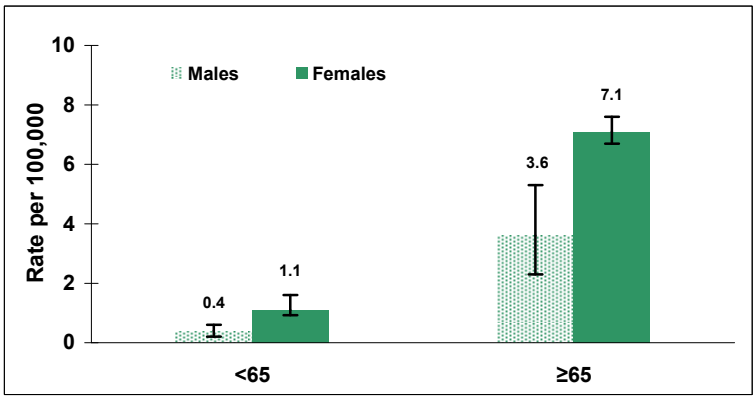
Data Source: West Virginia Vital Statistics.
Population: West Virginia residents.
Asthma Death = Death with a primary cause of asthma (ICD-10 J45-J46).

Figure 7.4
Asthma Mortality Rates by Age, 2000-2005



Data Source: West Virginia Vital Statistics.
Population: West Virginia residents.
Asthma Death = Death with a primary cause of asthma (ICD-10 J45-J46).

Figure 7.5
Asthma Mortality Rates by Age & Gender, 2000-2005



Data Source: West Virginia Vital Statistics.
Population: West Virginia residents.
Asthma Death = Death with a primary cause of asthma (ICD-10 J45-J46).

KEY FINDINGS

- *In West Virginia, females are significantly more likely to die from asthma than males. In the years 2000-2005, the age-adjusted asthma mortality rate was 1.8 per 100,000 among females, compared with 0.8 per 100,000 among males.*
- *Asthma mortality significantly increases with age. Adults aged 65 and older are significantly more likely to die of asthma than all younger age groups.*
- *The gender difference in asthma mortality increases with age. At age 65 and older, females have an asthma mortality rate nearly two times higher than males (7.1 per 100,000 versus 3.6 per 100,000)*
- *West Virginia females age 65 and older are most likely to die from asthma.*
- *U.S. mortality rates show similar gender and age trends (see Appendix D).*

CONCLUSION

The Burden of Asthma in West Virginia

The burden of asthma in West Virginia remains high. In fact, approximately 8.5% of West Virginians currently have asthma. This equals approximately 123,000 adults and 31,000 children. In addition, nearly 12% of West Virginians have ever been diagnosed with asthma (approximately 171,000 adults and 42,000 children). The prevalence of asthma among adults has been significantly higher in West Virginia than the United States in four out of the past seven years.

Although many asthma symptoms are preventable through appropriate medication use and avoidance of identified triggers, this report indicates that many West Virginians with asthma experience frequent daytime and nighttime symptoms that result in emergency room (ER) visits, hospitalizations, and decreased quality of life. In fact, the rate of asthma hospitalizations in West Virginia has increased dramatically, despite the fact that the prevalence of asthma has remained relatively stable. Between 2000 and 2005, the rate of asthma hospitalizations increased 30% (from 13.0 per 10,000 to 16.9 per 10,000). These hospitalizations cost West Virginians millions of dollars each year. Charges for the 3,078 asthma hospitalizations in 2005 totaled more than $23 million. Nearly two-thirds of these hospitalizations were charged to Medicare, Medicaid, or other government programs.

The expansion of the asthma surveillance system in West Virginia has resulted in new data on asthma symptoms, medication use, and health care utilization that were not available for inclusion in the original 2003 asthma burden report. However, gaps in the asthma surveillance system and in our knowledge of asthma in West Virginia still exist. For example, additional information on disease management (e.g., exposure to asthma triggers and asthma severity), health care utilization (i.e., asthma-related ER visits and hospital readmissions), and asthma among specific populations (i.e., children and the elderly) is needed.

Priority Populations for Intervention

Asthma surveillance data are used to identify and define the burden of asthma in West Virginia. One of the main goals of this report is to identify those populations in West Virginia disproportionately affected by asthma. This information is used by the West Virginia Asthma Education and Prevention Program (WV-AEPP) and the West Virginia Asthma Coalition (WVAC) to guide the planning and implementation of activities and interventions to address asthma in this state.

Based on asthma prevalence, hospitalization, and mortality indicators, four priority populations have been identified in West Virginia: 1) children, 2) elderly adults (age 65 and older), 3) adult women, and 4) West Virginians of low socioeconomic status (SES).

Over the next year, WV-AEPP and WVAC will develop a new statewide strategic plan for addressing asthma in West Virginia. This plan will outline goals, objectives, and activities related to reducing the burden of asthma among the four priority populations. An important component of this plan will be the maintenance and expansion of the asthma surveillance system. The plan will outline goals for obtaining new data to fill surveillance gaps, as well as plans for analyzing asthma surveillance data and assessing progress toward reducing the asthma burden among the priority populations.

Priority Populations for Asthma Intervention

- **CHILDREN:** Children under the age of 15 are more likely to be hospitalized due to asthma than West Virginians aged 15-44 and 45-64.
- **ELDERLY:** Adults aged 65 and older have the highest asthma hospitalization rates in West Virginia. The rate of elderly asthma hospitalizations has more than doubled since 1996.
- **ADULT WOMEN:** West Virginia women are more likely than men to have asthma and be hospitalized due to asthma.
- **LOW SES:** Adults with low levels of education and income are more likely to have asthma. In 2005, 30.7% of asthma hospitalizations were either charged to Medicaid, another governmental insurer (besides Medicare), or were paid out-of-pocket.

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APPENDIX A – DATA SOURCES

► Behavioral Risk Factor Surveillance System (BRFSS)

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based system of health surveys that collects information on health risk behaviors and health conditions. Random telephone surveys are conducted monthly in all 50 states, the District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands. West Virginia was 1 of the 15 initial states to conduct the survey when it was initiated in 1984 by the Centers for Disease Control and Prevention (CDC). Currently, the survey is conducted by the West Virginia Bureau for Public Health in collaboration with CDC. More than 3,000 West Virginia adults are interviewed each year.

The West Virginia BRFSS is the main source for information on adult asthma in the state. The survey questionnaire has included questions on adult lifetime and current asthma prevalence since 2000. In 2005 and 2006, additional questions on adult asthma symptoms, asthma medication use, and asthma-related medical visits were added to the questionnaire. In 2006, a question about work-related asthma among adults was also asked. Recently the BRFSS has begun including a limited number of questions about children. In 2005 and 2006, West Virginia adults were asked asthma prevalence questions about a randomly selected child in the household.

Strengths: Data on multiple topics are collected, allowing for analysis of associations between asthma and other risk behaviors, health conditions, and demographic characteristics. BRFSS data have been collected in a standard, reliable format for 23 years, allowing for analysis of time trends. BRFSS data are collected using a standard methodology in all states, allowing for state-to-state comparisons.

Limitations: Only civilian, noninstitutionalized persons 18 years of age and older who reside in households with telephones are eligible to be called for the survey. Therefore, state residents not included in this population are not represented in the prevalence estimates. In addition, BRFSS data must be interpreted with caution because they are self-reported. Individuals may have difficulty recalling past behavior or may understate behaviors known to be unhealthy, socially acceptable, or illegal.

Additional Information:
Centers for Disease Control and Prevention: www.cdc.gov/brfss
West Virginia Health Statistics Center, Bureau for Public Health: www.wvdhhr.org/bph/oehp/hsc/hschome.htm

► Children's Health Insurance Program (CHIP) Claims

The West Virginia Children's Health Insurance Program (CHIP) provides health care coverage to uninsured children who are not eligible to receive coverage through the Medicaid program. These children are in families whose incomes are too high to qualify for Medicaid, but are less than twice that of the current Federal Poverty Level. CHIP claims data are administrative data used for billing purposes. Disease conditions are identified by analyzing medical services diagnosis codes and prescription claims.

Strengths: CHIP claims data provide information on all medical services and prescriptions billed to CHIP for reimbursement. Therefore, the data are comprehensive of all enrollees who received treatment with a diagnosis of asthma. These data are not subject to the limitations of self-reported survey data (e.g., recall bias and misdiagnoses).

Limitations: Claims data are only representative of enrollees who received medical services or filled a prescription during the time period being studied. Therefore, if not all enrollees with asthma received asthma-related medical services, results may underestimate the true prevalence of the disease. Further, medical services diagnosis codes and prescription claims were used to identify CHIP recipients with asthma, based on modified criteria of the National Committee for Quality Assurance (NCQA). Results may vary depending on the criteria used to identify recipients with asthma.

Additional Information:
West Virginia Children's Health Insurance Program: www.wvchip.org
West Virginia Health Statistics Center Statistical Briefs: www.wvdhhr.org/bph/oehp/hsc/vr/publicat.htm

APPENDIX A – DATA SOURCES

► Hospital Discharge Database

The West Virginia Health Care Authority collects data on hospitalizations from all non-federal hospitals in the state. The Hospital Discharge Database includes information on admittance and discharge dates; patient characteristics such as age, gender, marital status, and county of residence; diagnoses codes; length of stay; facility; and payor. Asthma hospitalizations are identified based on diagnoses codes recorded by health care professionals. This information is used by the Health Care Authority in its two primary functions: to constrain the rising cost of health care and to assure reasonable access to necessary health services.

Strengths: The Hospital Billing Database contains information from virtually all hospitals in the state. The information is collected and reported in a standard format.

Limitations: Hospitalizations from the four VA hospitals in the state are not included in the database. The database does not include information on patient race or ethnicity.

Additional Information:
West Virginia Health Care Authority: www.hcawv.org

► Medicaid Fee-for-Service Claims

The West Virginia Medicaid Program provides health care coverage to low-income adults and children. West Virginians who qualify for Medicaid can enroll in either the fee-for-service program or the managed care program, *Mountain Health Trust*. Medicaid fee-for-service claims data are administrative data used for billing purposes. Disease conditions are identified by analyzing medical services diagnosis codes and prescription claims.

Strengths: Medicaid claims data provide information on all medical services and prescriptions billed to Medicaid for reimbursement. Therefore, the data are comprehensive of all enrollees of the fee-for-service plan who received treatment with a diagnosis of asthma. These data are not subject to the limitations of self-reported survey data (e.g., recall bias and misdiagnoses).

Limitations: Claims data are only representative of enrollees who received medical services or filled a prescription during the time period being studied. Therefore, if not all enrollees with asthma received asthma-related medical services, results may underestimate the true prevalence of the disease. These data are not representative of Medicaid recipients enrolled in the managed care program. Further, medical services diagnosis codes and prescription claims were used to identify Medicaid recipients with asthma, based on modified criteria of the National Committee for Quality Assurance (NCQA). Results may vary depending on the criteria used to identify recipients with asthma.

Additional Information:
West Virginia Bureau for Medical Services: www.wvdhhr.org/bms
West Virginia Health Statistics Center Statistical Briefs: www.wvdhhr.org/bph/oehp/hsc/vr/publicat.htm

APPENDIX A – DATA SOURCES

► National Hospital Discharge Survey (NHDS)

The National Hospital Discharge Survey (NHDS), which has been conducted annually since 1965, is a national probability survey designed to meet the need for information on characteristics of inpatients discharged from non-Federal short-stay hospitals in the United States. The NHDS collects data from a sample of approximately 270,000 inpatient records acquired from a national sample of about 500 hospitals. The survey includes information on the personal characteristics of patients (e.g., age, sex, marital status, race); administrative items such as admission and discharge dates; and patient medical diagnoses and procedures. The NHDS is conducted by the National Center for Health Statistics, Centers for Disease Control and Prevention.

Strengths: The NHDS has been conducted in a standard format for multiple years, allowing for analysis of hospitalizations over time.

Limitations: The NHDS is a sample of all hospitalizations that occurred; therefore, there is error associated with the estimated rates calculated from the survey. Only hospitals with an average length of stay of fewer than 30 days for all patients, general hospitals, or children's general hospitals are included in the survey. Federal, military, and Department of Veterans Affairs hospitals, as well as hospital units of institutions (such as prison hospitals), and hospitals with fewer than six beds staffed for patient use, are excluded.

Additional Information:
Centers for Disease Control and Prevention: www.cdc.gov/nchs/about/major/hdasd/nhds.htm

► National Survey of Children's Health (NSCH)

The National Survey of Children's Health (NSCH) was created by the U.S. Maternal and Child Health Bureau after it identified a lack of national and state-specific data on the health and well-being of children under the age of 18. The NSCH is a random telephone survey conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention. Adult proxies are interviewed about a randomly selected child in the household. A total of 102,353 surveys were completed in 2003-2004. An adequate number of surveys were completed in each state to yield valid, reliable, and comparable state estimates. The survey is scheduled to be repeated in 2007.

The NSCH collects information on children's physical, emotional, and behavioral health, as well as information on family context and neighborhood environment. Questions on asthma prevalence, asthma attacks, asthma hospital stays, and family burden due to asthma are also asked.

Strengths: The NSCH is the only source for comprehensive data on children's health in West Virginia. Data on multiple topics are collected, allowing for analysis of associations between asthma and other risk behaviors, health conditions, and demographic characteristics. NSCH data were collected by a federal agency using a standard methodology in all states, allowing for state-to-state comparisons.

Limitations: Only civilian, noninstitutionalized children who reside in households with telephones are eligible to be chosen for the survey. Therefore, state residents not included in this population are not represented in the prevalence estimates. In addition, results must be interpreted with caution because they are based on proxy reports (i.e., the interview was completed by the parent/guardian most knowledgeable about the randomly selected child's health). Parents/guardians may have difficulty recalling health details or may understate behaviors and characteristics known to be unhealthy, socially unacceptable, or illegal.

Additional Information:
Centers for Disease Control and Prevention: www.cdc.gov/nchs/about/major/slaits/nsch.htm
NSCH Data Resource Center: http://nschdata.org/Content/Default.aspx

► School Electronic Health Record

The West Virginia School Electronic Health Record System aids school nurses in the documentation of physician-ordered health care procedures and the development of health care plans for public school students with these orders. This system was implemented in Fall 2006 by the West Virginia Department of Education, Office of Healthy Schools. It currently tracks 10 health care procedures representing a range of complexity (i.e., insulin injection, insulin pump, rectal valium, vagal nerve stimulator, mechanical ventilator, metered-dose inhaler, tracheotomy care, tracheotomy replacement, sterile suction, and sterile catheterization), as well as health care plans for students with asthma, diabetes, seizures, and other health conditions who have a physician's order for these procedures at school.

The information collected in this system is being used by the Office of Healthy Schools to distribute $1 million in supplemental funding received from the legislature in 2006 and 2007 for school health services. It was decided that these funds would be distributed to counties based on the number and type of health care procedures being administered by school nurses. To be eligible for supplemental funding, school districts recorded and reported the information in the Electronic Health Record to the Office of Healthy Schools. In the future, the Electronic Health Record will be expanded to include all health conditions and all procedures performed by school nurses.

Strengths: The Electronic Health Record System is a standardized method for collecting information on school health services. Data are available by county.

Limitations: These data are only representative of public school students. Further, school districts are not currently required to submit these data to the Office of Healthy Schools. In fact, as of March 26, 2007, four counties had not reported any data. Therefore, the results may be incomplete.

Additional Information:
West Virginia Department of Education, Office of Healthy Schools: http://wvde.state.wv.us/osshp/main

APPENDIX A – DATA SOURCES

► School Nurse Needs Assessment

West Virginia Code §18-5-22 requires the employment of school nurses and the formation of a Council of School Nurses. Each school nurse is required to periodically perform a needs assessment. These data are compiled at the county level, collected by the Council of School Nurses, and sent to the West Virginia Department of Education, Office of Healthy Schools for analysis and compilation into a report. The School Nurse Needs Assessment collects data on school nurse professional preparation, school health services, health cases requiring involvement of school nurses, and the number of students requiring specialized health care procedures. The data reflect the health status of West Virginia students and are used to determine which essential services are being provided to students.

The School Nurse Needs Assessment was collected in the following school years: 1989-1990, 1990-1991, 1994-1995, 1997-1998, 1999-2000, 2002-2003, and 2004-2005.

Strengths: It is comprehensive of all health cases, specialized health care procedures, and health care services in West Virginia public schools. Data are available by grade.

Limitations: These data are only representative of public school students. The degree to which data are collected in a standardized method is unknown. Counties and schools vary in the way this information is recorded and tracked. Further, the data may be incomplete due to partial reporting:

- 1997-1998: 52 of 55 school districts reported data
- 1999-2000: 53 of 55 school districts reported data
- 2002-2003: 53 of 55 school districts reported data
- 2004-2005: 37 of 55 school districts reported complete data, 10 counties reported partial data

Additional Information:
West Virginia Department of Education, Office of Healthy Schools: http://wvde.state.wv.us/osshp/main

► Vital Statistics

Information on deaths in West Virginia and the United States is obtained from vital records. Vital records include information that is collected on death certificates, such as demographic characteristics of the deceased and cause and manner of death. The West Virginia Vital Registration System manages all West Virginia birth, death, marriage, and divorce records. These records are collected, verified, and stored by the West Virginia Health Statistics Center of the West Virginia Department of Health and Human Resources. The National Vital Statistics System is managed by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention. State vital records are collected and compiled by NCHS.

Strengths: Death counts from vital records are very accurate since virtually all deaths in West Virginia and the United States are reported. These records have been collected by states using standards outlined by NCHS, allowing for state-to-state comparisons.

Limitations: Cause of death is reported on death certificates by medical professionals using codes and rules outlined in the International Classification of Diseases (ICD) developed by the World Health Organization. These codes are periodically revised and these revisions sometimes result in changes to the way in which primary cause of death is determined and recorded. Therefore, trend analysis for certain causes of death are not possible across ICD versions. The new ICD-10 system, implemented in 1999, included new rules for recording respiratory deaths. The conversion from ICD-9 to ICD-10 accounts for an 11% decrease in asthma deaths between 1998 and 1999.

Additional Information:
West Virginia Health Statistics Center: http://www.wvdhhr.org/bph/oehp/hsc/default.htm
National Vital Statistics System: http://www.cdc.gov/nchs/nvss.htm
CDC Wonder, an Internet data query system: http://wonder.cdc.gov/
International Classification of Diseases: http://www.cdc.gov/nchs/about/major/dvs/icd10des.htm

APPENDIX A – DATA SOURCES

► Workers' Compensation Program Claims

The West Virginia workers' compensation insurance system provides reimbursement for medical expenses and lost wages incurred by employees injured on the job. As of January, 1, 2006, the West Virginia Workers' Compensation Law stated that workers' compensation is compulsory for all employers in the state of West Virginia. However, any employers with fewer than three employees and agricultural services employers with fewer than five employees are not required to subscribe to the workers' compensation program. Since 2005, the workers' compensation fund has been managed by BrickStreet Insurance. Prior to 2005, the fund was managed by a state agency. Data from the West Virginia workers' compensation claims database is analyzed and provided by the Institute of Occupational and Environmental Health (IOEH) at West Virginia University.

Strengths: The workers' compensation claims database includes claims for nearly all work-related injuries in West Virginia, since virtually all employers carry workers' compensation insurance and most work-related injuries in West Virginia are reported.

Limitations: The workers' compensation claims process can be lengthy depending on the severity of the injury. Therefore, there may sometimes be significant delays between the date of injury and claim review and approval process. Only approved claims are included in the workers' compensation database analyzed by IOEH. In addition, injuries of short duration or those not requiring medical care may not be reported.

Additional Information:
Institute of Occupational and Environmental Health: www.hsc.wvu.edu/ioeh

► Youth Tobacco Survey (YTS)

The Youth Tobacco Survey was developed by the Centers for Disease Control and Prevention as a surveillance and evaluation tool for state tobacco prevention programs. The West Virginia Youth Tobacco Survey (WV-YTS) collects information on tobacco use, attitudes and knowledge regarding tobacco, exposure to tobacco-related media, exposure to environmental tobacco smoke, and asthma among adolescents. The WV-YTS is conducted by the West Virginia Division of Tobacco Prevention and the West Virginia Department of Education in collaboration with the Centers for Disease Control and Prevention.

The WV-YTS was administered to public middle school students in 2000 and 2002 and to public high school students in 2000, 2002, and 2005. The 2002 and 2005 surveys included questions related to asthma prevalence, asthma attacks, asthma medication use, and missed school due to asthma. In 2002, 10,052 public middle school students and 1,640 public high school students completed the Youth Tobacco Survey. The survey was completed by 1,260 public high school students in 2005. Data from the 2007 YTS, which was administered to public middle schools and high schools in spring 2007, will be available later this year. The data were collected on a paper questionnaire.

Strengths: The WV-YTS provided our first information on asthma among West Virginia adolescents. Extensive data on tobacco use and exposure to environmental tobacco smoke are collected, allowing for analysis of associations between asthma and smoking. WV-YTS data have been collected in a standard format for a few years, allowing for analysis of time trends. YTS data are collected using a standard methodology by all states, allowing for state-to-state comparisons.

Limitations: Only public middle school and high school students (grades 6-12) are eligible to participate in the survey. Therefore, West Virginia adolescents not included in this population are not represented in the prevalence estimates. In addition, WV-YTS data must be interpreted with caution because they are self-reported. Individuals may have difficulty recalling past behavior or may understate behaviors known to be unhealthy, socially unacceptable, or illegal.

Additional Information:
Centers for Disease Control and Prevention: www.cdc.gov/tobacco/NYTS/nyts2004.htm
West Virginia Division of Tobacco Prevention, Bureau for Public Health: www.wvdtp.org

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APPENDIX B – SURVEY QUESTIONS

Table A1
West Virginia Behavioral Risk Factor Surveillance System
Asthma Questions and Response Categories

ADULT ASTHMA PREVALENCE (CORE) Asked in the years 2000-2006*	
1. Have you ever been told by a doctor, nurse, or other health professional that you had asthma?	1 = Yes 2 = No ⇨ **Go to next module** 7 = Don't know / Not sure ⇨ **Go to next module** 9 = Refused ⇨ **Go to next module**
2. Do you still have asthma?	1 = Yes 2 = No 7 = Don't know / Not sure 9 = Refused
ADULT ASTHMA HISTORY MODULE **Asked in the years 2005-2006**	
If "yes" to CORE Question 1, continue.	
1. How old were you when you were first told by a doctor, or other nurse that you had asthma?	11-96 = Age in years **[96 = 96 and older]** 9 7 = Age 10 or younger 9 8 = Don't know/Not sure 9 9 = Refused
If "yes" to CORE Question 2, continue.	
2. During the past 12 months, have you had an episode of asthma or an asthma attack?	1 = Yes 2 = No 7 = Don't know / Not sure 9 = Refused
3. During the past 12 months, how many times did you visit an emergency room or urgent care center because of your asthma?	1-87 = Number of visits [87 = 87 or more] 8 8 = None 9 8 = Don't know/Not sure 9 9 = 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?	1-87 = Number of visits [87 = 87 or more] 8 8 = None 9 8 = Don't know/Not sure 9 9 = 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?	1-87 = Number of visits [87 = 87 or more] 8 8 = None 9 8 = Don't know/Not sure 9 9 = Refused
6. During the past 12 months, how many days were you unable to work to carry out your usual activities because of your asthma?	1-365 = Number of days 8 8 8 = None 7 7 7 = Don't know/Not sure 9 9 9 = 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?	Please Read Would you say: 8 = Not at any time ⇨ **Go Q9** 1 = Less than once a week 2 = Once or twice a week 3 = More that 2 times a week, but not every day 4 = Every day, but not all the time 5 = Every day, all the time 7 = Don't know/Not sure 9 = Refused

Table A1, Cont.
West Virginia Behavioral Risk Factor Surveillance System
Asthma Questions and Response Categories

8. During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?	Please Read Would you say: 8 = None 1 = 1-2 days 2 = 3-4 days 3 = 5 days 4 = 6-10 days 5 = More than 10 days 7 = Don't know/Not sure 9 = Refused
9. During the past 30 days, how often did you take a prescription asthma medication to prevent an asthma attack from occurring?	Please Read Would you say: 8 = Never 1 = 1-14 days 2 = 15-24 days 3 = 25-30 days 7 = Don't know / Not sure 9 = Refused
10. During the past 30 days, how often did you use a prescription asthma inhaler during an asthma attack to stop it? **INTERVIEWER INSTRUCTION: How often (number of times) does NOT equal number of puffs. Two to three puffs are usually taken each time the inhaler is used.**	8 = Never (includes no attacks) 1 = 1-4 times 2 = 5-14 times 3 = 15-29 times 4 = 30-59 times 5 = 60-99 times 6 = More than 100 times 7 = Don't know / Not sure 9 = Refused
CHILDHOOD ASTHMA PREVALENCE MODULE **Asked in the years 2005-2006**	
If there are no children under age 18 in the household, or the respondent refused this information, ⇨ Go to next module	
1. Has a doctor or other medical professional EVER said that the child has asthma?	1 = Yes 2 = No ⇨ **Go to next module** 7 = Don't know / Not sure ⇨ **Go to next module** 9 = Refused ⇨ **Go to next module**
2. Does the child still have asthma?	1 = Yes 2 = No 7 = Don't know / Not sure 9 = Refused
OCCUPATIONAL ASTHMA **State-added question asked in 2006**	
If "yes" to CORE Question 1, continue.	
1. Was your asthma caused or made worse by chemicals, smoke, fumes, or dust in any job you ever had?	1 = Yes 2 = No 3 = Never been employed 7 = Don't know / Not sure 9 = Refused

* In 2000, Core Question 1 was worded differently: "Did a doctor ever tell you that you had asthma?"

APPENDIX B – SURVEY QUESTIONS

Table A2
National Survey of Children's Health, 2003
Asthma Questions and Response Categories

QUESTION	RESPONSE CATEGORIES
Has a doctor or health professional ever told you that [CHILD] has any of the following conditions: S2Q19: Asthma?	0 = No 1 = Yes 6 = Don't know 7 = Refused
(If the sampled child does not have asthma – i.e., S2Q19 in (0,6,7) – skip to S2Q54) S2Q49: Does [CHILD] still have asthma?	0 = No ⇨ **Skip to S2Q52** 1 = Yes 6 = Don't know ⇨ **Skip to S2Q52** 7 = Refused ⇨ **Skip to S2Q52**
S2Q50: Would you describe the health difficulties caused by [his/her] asthma as minor, moderate, or severe?	1 = Minor difficulties 2 = Moderate difficulties 3 = Severe difficulties 6 = Don't know 7 = Refused
S2Q51: Overall, would you say [his/her] asthma puts a burden on your family a great deal, a medium amount, a little, or not at all?	1 = A great deal 2 = A medium amount 3 = A little 4 = Not at all 6 = Don't know 7 = Refused
S2Q52: How long has it been since [he/she] last took asthma medication?	1 = Less than one day ago 2 = 1-6 days ago 3 = 1 week to less than 3 months ago 4 = 3 months to less than 1 year ago 5 = 1 year to less than 3 years ago 6 = 3 years to 5 years ago 7 = More than 5 years ago 8 = Has never used medication 96 = Don't know 97 = Refused
S2Q52A: During the past 12 months, has [CHILD] had an episode of asthma or an asthma attack? **INTERVIEWER HELP: Asthma attacks, sometimes called episodes, refer to periods of worsening asthma symptoms that make the respondent limit his/her activity more than usual, or makes him/her seek medical care.**	0 = No 1 = Yes 6 = Don't know 7 = Refused
S2Q53: During the past 12 months, has [CHILD] stayed overnight in a hospital because of [his/her] asthma? **INTERVIEWER HELP: If the child is in the hospital for asthma and other reasons the correct answer choice is Yes.**	0 = No 1 = Yes 6 = Don't know 7 = Refused

APPENDIX B – SURVEY QUESTIONS

Table A3
West Virginia Youth Tobacco Survey
Asthma Questions and Response Categories

QUESTION	RESPONSE CATEGORIES	YEAR & SCHOOLS SURVEYED
Have you ever been told by a doctor that you have asthma?	1 = Yes 2 = No 3 = I don't know	Middle Schools: 2002 High Schools: 2002, 2005
Have you ever been told by any health professional that you have asthma?	1 = Yes 2 = No 3 = I don't know	High Schools: 2002, 2005
Do you still have asthma?	1 = Yes 2 = No 3 = I don't know	High Schools: 2002, 2005
Have you had an asthma attack or episode of asthma in the past 12 months?	1 = Yes 2 = No 3 = I don't know	Middle Schools: 2002 High Schools: 2002, 2005
Are you currently taking prescription medicine for asthma?	1 = Yes 2 = No 3 = I don't know	Middle Schools: 2002 High Schools: 2002, 2005
During this school year, how many days of school did you miss due to your asthma?	1 = 11 or more days 2 = 6-10 days 3 = 1-5 days 4 = None 5 = I don't know	Middle Schools: 2002 High Schools: 2002, 2005

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APPENDIX C – METHODOLOGY

► Rates

The statistics presented in this report are rates. A rate is a measure of some event, disease, or condition in relation to a unit of population, along with some specification of time. In other words, rates are calculated by dividing the number of events in a given time period by the number of people at risk of experiencing the event in that time period. Counts of events or conditions are obtained or estimated from multiple sources such as surveys, vital records, and administrative databases. Population counts are obtained from the United States Census Bureau.

Rates are typically presented and interpreted per 10,000 or per 100,000 population. For example, a rate of 50 per 10,000 means that for every 10,000 people in the population, 50 experienced the event. Percentages are rates presented per 100 population.

Because rates are calculated from counts of events and population, they are affected by changes and/or differences in the number of events and/or the size and distribution of the population. For example, an increase in the asthma death rate between two years may occur because the number of deaths due to asthma increased. However, even if the number of deaths did not increase, the rate may still increase if the number of people in the population decreased.

Age adjustment is a method for standardizing rates to eliminate the effects of population changes or differences. Age-adjusted rates are computed by applying age-specific rates in a population of interest to a standardized age distribution. Many health conditions and events are related to age. Age adjustment eliminates differences in rates that are due to differences in the age composition of the populations. Age-adjusted rates are used when comparing rates of two different populations (e.g., men vs. women or West Virginia vs. the United States) or when comparing rates in a single population over time. Age-adjusted rates in this report have been adjusted to the 2000 US Standard Population. Rates that are not age adjusted are called crude rates.

It is important to note that age adjustment may distort the true rate of the event within a population. For example, diabetes is more common among older adults. West Virginia has one of the oldest populations in the country and one of the highest rates of diabetes. Therefore, in West Virginia the diabetes age-adjusted rate is lower than the crude rate. Presenting only the age-adjusted rate would be under-reporting the true prevalence of the disease in West Virginia. The purpose of this report is to understand the total burden of asthma in West Virginia and to identify groups and regions most affected by asthma, regardless of age. Therefore, the majority of rates presented in this report are not age-adjusted.

APPENDIX C – METHODOLOGY

► Estimates and Confidence Intervals

Rates calculated from surveys such as the Behavioral Risk Factor Survey (BRFSS), National Survey of Children's Health (NSCH), and Youth Tobacco Survey (YTS), are considered estimates since they are based on responses from a sample of the population of interest, rather than the entire population. Confidence intervals account for sampling and nonsampling errors in data collection and are an indication of the reliability and precision of an estimate. They represent the range of values among which the true value would be found. This report presents 95% confidence intervals (95% CI), meaning that the true value would be within the given interval 95% of the time.

Confidence intervals are mainly affected by the number of responses or events that the estimate is based on. That is, estimates based on a small number of responses or events typically have large confidence intervals. There are a few simple analysis techniques that can be applied to ensure that the number of responses or events is large enough to produce precise estimates with narrow confidence intervals. See the "Reliability of Rates" section for a discussion of these techniques.

Confidence Intervals for BRFSS, NSCH, and YTS Estimates

Confidence intervals for BRFSS and NSCH estimates were derived from the survey procedures in SAS, a statistical software package. Confidence intervals for YTS estimates were calculated by the following formulas:

95% Confidence Interval (CI) = $1.96 * SE$
Lower 95% Confidence Limit = $E - CI$
Upper 95% Confidence Limit = $E + CI$

where,
SE is the standard error of the estimate produced by SAS survey procedures.
E is the weighted estimate produced by SAS survey procedures.

Confidence Intervals for Mortality Rates

Confidence intervals for mortality rates were calculated based on methods used by the National Center for Health Statistics (NCHS). The 95% confidence interval methodology is dependent on the number of deaths used in the calculation of the mortality rate.

References:

National Center for Health Statistics. Center for Disease Control and Prevention. *Mortality Technical Appendix.* Available online at www.cdc.gov/nchs/datawh/statab/pubd/ta.htm.

Hoyert DL, Heron MP, Murphy SL, Kung H. *Deaths: Final Data for 2003*. National Vital Statistics Reports; 54(13). Hyattsville, MD: National Center for Health Statistics. 2006.

95% Confidence Interval Methodology for Rates Based on <100 Deaths:

Lower 95% Confidence Limit = $R * L(D)$
Upper 95% Confidence Limit = $R * U(D)$

where,
R is the mortality rate.
L & *U* are the lower and upper 95% confidence limit factors that correspond with the number of deaths (*D*) in the numerator of the mortality rate. These factors are contained in the NCHS Mortality Technical Appendix.
Note: For age-adjusted rates, the number of deaths (*D*) used in the confidence limit factors table to obtain *L* and *U* must be adjusted. This methodology is available from the references listed above.

95% Confidence Interval Methodology for Rates Based on ≥100 Deaths:

Lower 95% Confidence Limit = R – (1.96 * $SE(R)$)
Upper 95% Confidence Limit = R + (1.96 * $SE(R)$)

where,
R is the mortality rate.

$SE(R)$ for crude or age-specific rates = $\frac{R}{\sqrt{D}}$, *where* D = the number of deaths.

$SE(R)$ for age-adjusted rates = $\sqrt{\sum_i \left[\left(\frac{P_{si}}{P_s} \right)^2 \left(\frac{R_i^2}{D_i} \right) \right]}$,

where,
R_i = Age-specific rate for the *i*th age group.
P_{si} = Age-specific US standard population for the *i*th age group.
P_s = Total US standard population.
D_i = Number of deaths in the *i*th age group.

► Significance

"Significant" is the term used to describe rates that have been tested and found to be statistically different. Statistically significant differences between rates are traditionally determined using statistical tests such as a t-test or chi-squared test. Often when analyzing results of a survey with a large number of respondents, such as the Behavioral Risk Factor Survey, statistical tests will indicate significant differences between rates even when the difference is small. Therefore, this report uses a more conservative method for determining significance.

In this report, two rates are said to be significantly different when the 95% confidence limits associated with each of the rates do not overlap. In other words, it can be stated with 95% certainty that the difference found between the two rates is not a random occurrence. Although this is not the "classical" statistical test of differences, it is a better method of identifying meaningful differences for health promotion intervention.

► Reliability of Rates

Reliability refers to the precision of a rate. If a rate is termed reliable, there is confidence that the same, or a very similar, rate would be obtained if the data were to be collected again within the same time period and under similar circumstances. Rates that are determined to be unreliable may not reflect the true prevalence; therefore they should be reported and interpreted with caution.

CDC recommends that the following three criteria be used to assess reliability of rates. In this report, rates that do not meet one or more of these criteria are noted in the detailed tables in Appendix D.

1) The number of responses or events that the rate is based on. Rates calculated from BRFSS, YTS, and NSCH data should be based on at least 50 survey responses. Mortality rates should be based on at least 20 deaths.

2) The width or range of the 95% confidence interval (95% CI). Rates in which the width of the corresponding 95% CI is greater than 20 should be interpreted with caution.

3) The magnitude of the relative standard error (RSE). The RSE of the rate should be less than 30.0. The RSE is obtained by dividing the standard error of the estimate by the estimate itself.

A few simple analysis techniques can be applied to increase the reliability of rates. One option, when doing subgroup analysis, is to collapse categories. For example, age can be collapsed into three categories instead of six. A second option is to calculate a multi-year estimate by combining two or more years of data. The first option is often ideal if it is important or necessary to produce individual year estimates, although details on specific subgroups may not be available. The second technique is useful for: 1) producing a stable estimate when the yearly estimates are highly variable, and 2) obtaining a large enough number of responses to produce an estimate for a small population or uncommon event. Both of these techniques are applied throughout this report.

APPENDIX C – METHODOLOGY

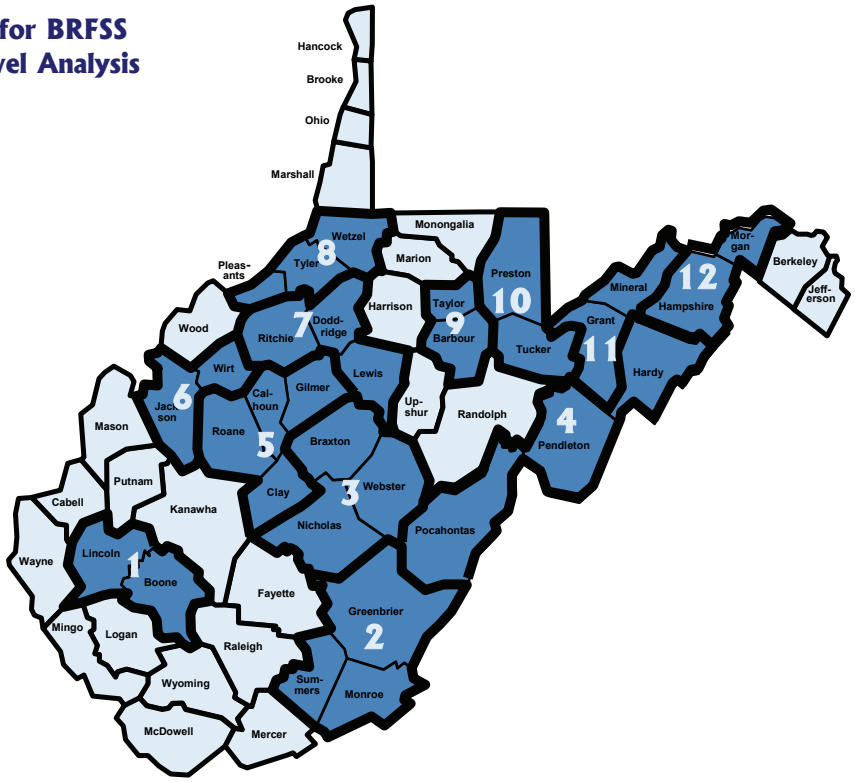
► BRFSS County Prevalence Estimates

Approximately 3,500 adults are interviewed each year as part of the Behavioral Risk Factor Surveillance System (BRFSS). These interviews are not evenly distributed across the state. That is, counties with larger populations are more likely to be represented than counties with small populations. Therefore, in order to have large enough sample sizes to produce reliable county estimates of adult asthma prevalence, five years of BRFSS data must be combined and some counties must be grouped for analysis.

The BRFSS data are weighted each year to be representative of the West Virginia adult age and sex population distribution for that year. To produce accurate county estimates, the multi-year data file is re-weighted to be representative of the Census 2000 age and sex population distribution of each county or county region.

This report presents 2001-2005 county estimates of adult asthma. These estimates are representative of the five-year period. Single-year county estimates are not available. Sample sizes were large enough for 24 of the 55 counties to stand alone. However, the additional 31 counties were grouped into 12 county regions. The multi-county estimates are representative of the region. Individual county estimates are not available for these 31 counties. Figure C1 portrays the county groupings used in analysis.

Figure C1
Groupings for BRFSS County Level Analysis



Group	Counties	Group	Counties
1	Boone, Lincoln	7	Doddridge, Lewis, Ritchie
2	Greenbrier, Summers, Monroe	8	Pleasants, Tyler, Wetzel
3	Braxton, Nicholas, Webster	9	Barbour, Taylor
4	Hardy, Pendleton, Pocahontas	10	Preston, Tucker
5	Calhoun, Clay, Gilmer, Roane	11	Grant, Mineral
6	Jackson, Wirt	12	Hampshire, Morgan

APPENDIX C – METHODOLOGY

► County Rural-Urban Continuum Codes

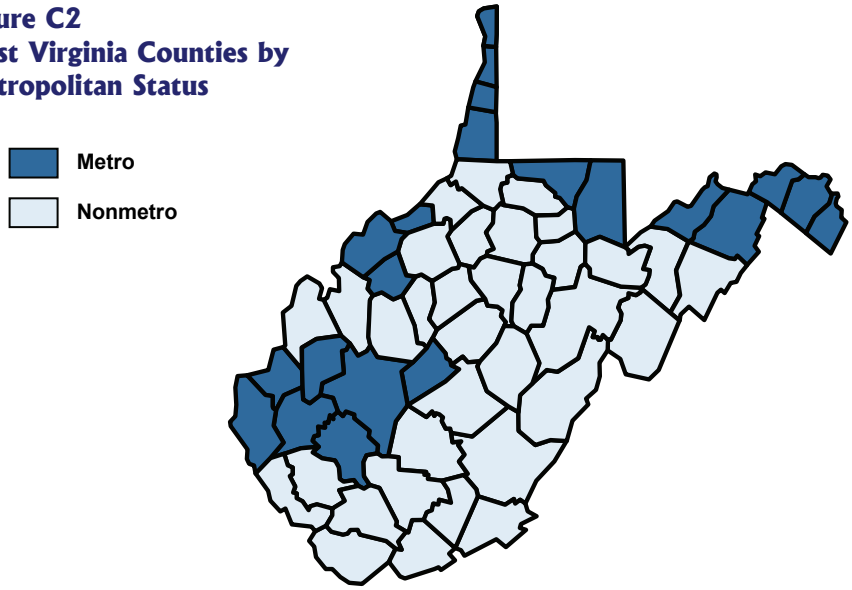
All United States counties are classified as either metropolitan or nonmetropolitan (nonmetro) by the United States Office of Management and Budget (OMB). These classifications are based on Census 2000 population counts and worker commuting patterns. The United States Department of Agriculture has expanded this classification scheme to include three metro and six nonmetro categories (see Table C1). This scheme distinguishes metropolitan counties by the population size of their metro area and nonmetropolitan counties by degree of urbanization and adjacency to a metro area. Based on this scheme, West Virginia has 21 metro counties and 34 nonmetro counties (see Table C2). In this report, the prevalence of asthma among adults was calculated for the 21 metro counties combined and the 34 nonmetro counties combined. These results are presented in Figure 1.10.

Table C1. USDA 2003 Rural-Urban Continuum Codes

Code	Code Description	West Virginia Counties
Metro Counties		
1	Counties in metro areas of 1 million population or more	Jefferson
2	Counties in metro areas of 250,000 to 1 million population	Boone, Cabell, Clay, Kanawha, Lincoln, Putnam, Wayne
3	Counties in metro areas of fewer than 250,000 population	Berkeley, Brooke, Hampshire, Hancock, Marshall, Mineral, Monongalia, Morgan, Ohio, Pleasants, Preston, Wirt, Wood
Nonmetro Counties		
4	Urban population of 20,000 or more, adjacent to a metro area	Marion, Raleigh
5	Urban population of 20,000 or more, not adjacent to a metro area	Harrison, Mercer
6	Urban population of 2,500 to 19,999, adjacent to a metro area	Fayette, Grant, Jackson, Logan, Mason, Mingo, Nicholas, Roane, Taylor, Tyler, Wetzel
7	Urban population of 2,500 to 19,999, not adjacent to a metro area	Barbour, Greenbrier, Lewis, McDowell, Randolph, Summers, Upshur, Wyoming
8	Completely rural or less than 2,500 urban population, adjacent to a metro area	Braxton, Calhoun, Hardy, Monroe, Pendleton, Ritchie
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area	Doddridge, Gilmer, Pocahontas, Tucker, Webster

Source: USDA Economic Research Service (www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/).

Figure C2
West Virginia Counties by Metropolitan Status



APPENDIX C – METHODOLOGY

► Assignment of Adult Asthma Severity Classification

Asthma severity classification was assigned for adult respondents to the Behavioral Risk Factor Survey based on four criteria: asthma symptoms, asthma sleep disturbances, asthma urgent or acute care visits, and asthma-related activity limitations. Respondents were assigned a severity score for their response to each element (see Table C2). The final severity score was the highest score from any of the four elements. For example, if a respondent scored a Step 4 on *Symptoms* and a Step 1 on *Sleep Disturbances*, *Urgent/Acute Care Visits*, and *Activity Limitations*, the respondent was assigned a severity classification of severe persistent. This methodology is based on the severity classification criteria outlined by the NAEPP *Guidelines for the Diagnosis and Management of Asthma* (see Table 2.1 in Chapter 2 for these criteria). It was obtained from the National Asthma Control Program, Air Pollution and Respiratory Health Branch, National Center for Environmental Health, Centers for Disease Control and Prevention.

It is important to note that this methodology may underestimate asthma severity. Asthma severity is clinically determined before medical treatment. BRFSS survey respondents reported current asthma symptoms, regardless of treatment. Some respondents with persistent or severe asthma may experience few symptoms due to proper treatment and management. Therefore, it is likely that they would be classified using this methodology with a less severe classification.

Table C2. Criteria for Assignment of Asthma Severity Classification

Question	Step 1 Mild Intermittent	Step 2 Mild Persistent	Step 3 Moderate Persistent	Step 4 Severe Persistent
Symptoms Symptoms of asthma include coughing wheezing, shortness of breath, chest tightness and phlegm production when you do not have a cold or respiratory infection. During the past 30 days, how often did you have any symptoms of asthma?	▪ Not at any time ▪ Less than once a week ▪ 1-2 times a week	More than 2 times a week, but not everyday	Every day, but not all the time	Every day, all the time
Sleep Distrubances During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?	▪ None ▪ 1-2 days	3-4 days	▪ 5 days ▪ 6-10 days	More than 10 days
Urgent/Acute Care Visits Sum of responses to these questions: ▪ During the past twelve months, how many times did you visit an emergency room or urgent care center because of your asthma? (Range: 0-87 times) ▪ 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? (Range: 0-87 times)	None	1-2 times	3-6 times	7 or more times
Activity Limitations During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?	None	1-5 days	6-75 days	75-365 days

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APPENDIX D – DETAILED TABLES

CHAPTER 1 – ASTHMA PREVALENCE

D1.1 Lifetime and Current Asthma: Adults, BRFSS

WEST VIRGINA						
Year	Lifetime Asthma[a]			Current Asthma[b]		
	Number[c]	%	95% CI	Number[c]	%	95% CI
2000	162,200	11.7	10.3-13.2	117,000	8.5	7.3-9.7
2001	173,500	12.5	11.2-13.8	128,900	9.3	8.2-10.4
2002	179,100	12.8	11.5-14.1	126,900	9.1	8.0-10.2
2003	166,800	11.8	10.6-13.0	114,100	8.1	7.1-9.1
2004	219,900	15.5	14.1-16.9	143,400	10.1	9.0-11.2
2005	191,100	13.4	12.0-14.8	131,100	9.2	8.1-10.4
2006	170,600	11.9	10.5-13.2	122,900	8.6	7.4-9.7
UNITED STATES[d]						
Year	Lifetime Asthma[a]			Current Asthma[b]		
	Number[c]	%	95% CI	Number[c]	%	95% CI
2000	20,827,700	10.4	10.2-10.7	14,306,300	7.2	7.0-7.4
2001	23,210,300	11.0	10.8-11.2	15,139,300	7.2	7.0-7.4
2002	25,176,200	11.8	11.6-12.0	15,960,500	7.5	7.3-7.7
2003	25,777,200	11.9	11.6-12.1	16,640,200	7.7	7.5-7.9
2004	29,064,300	13.3	13.1-13.6	17,624,900	8.1	7.9-8.3
2005	27,522,700	12.5	12.2-12.7	17,273,400	7.9	7.7-8.0
2006	28,534,300	12.8	12.5-13.0	18,272,400	8.2	8.0-8.4

a. Lifetime Asthma = Responding "yes" to "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"
b. Current Asthma = Responding "yes" to both the lifetime asthma question and to "Do you still have asthma?"
c. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
d. United States estimates include 50 states and District of Columbia. Territories not included in these estimates.
Data Source: Behavioral Risk Factor Surveillance System.

D1.2 Current Asthma[a] by Gender: Adults, WVBRFSS

Year	Male			Female		
	Number[b]	%	95% CI	Number[b]	%	95% CI
2000	43,400	6.7	4.9-8.4	73,600	10.1	8.4-11.9
2001	48,300	7.4	5.7-9.0	80,500	11.0	9.4-12.6
2002	47,500	7.1	5.6-8.7	79,400	10.9	9.4-12.4
2003	35,600	5.3	4.0-6.6	78,500	10.7	9.2-12.2
2004	50,800	7.5	5.9-9.1	92,600	12.5	10.9-14.2
2005	38,200	5.6	4.1-7.1	92,900	12.6	10.9-14.3
2006	36,600	5.3	3.9-6.6	86,200	11.7	9.9-13.5

a. Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of adults with asthma. It is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
Data Source: West Virginia Behavioral Risk Factor Surveillance System.

D1.3 Current Asthma[a] by Selected Characteristics: Adults, WVBRFSS

Characteristic	2000-2002			2003-2005		
	Number[b]	%	95% CI	Number[b]	%	95% CI
TOTAL	124,300	9.0	8.3-9.6	129,500	9.1	8.5-9.8
AGE						
18-44	59,800	9.1	8.1-10.2	57,000	8.8	7.8-9.9
45-64	42,600	9.4	8.3-10.6	46,400	9.6	8.6-10.6
≥ 65	21,900	7.9	6.6-9.2	25,800	9.1	7.9-10.3
RACE						
White	117,700	8.9	8.2-9.6	122,600	9.1	8.4-9.7
Black	2,900	10.0	5.3-14.8	3,900	11.7	6.2-17.1
Other	2,700	10.4	5.0-15.8	2,700	10.3	5.8-14.8
EDUCATION						
< High School	31,200	12.5	10.7-14.3	34,300	13.5	11.7-15.3
High School Grad	48,800	8.6	7.5-9.6	47,800	8.5	7.5-9.5
Some College	25,500	8.1	6.8-9.4	27,100	8.5	7.2-9.9
College Grad	18,500	7.3	5.9-8.8	20,200	7.2	6.0-8.5
HOUSEHOLD INCOME[c]						
< $25,000	53,300	11.1	10.0-12.3	67,000	14.1	12.8-15.4
$25,000 - $49,999	32,400	7.4	6.3-8.5	29,200	7.4	6.3-8.5
≥ $50,000	18,400	6.4	5.1-7.7	19,700	5.4	4.4-6.3
SOCIOECONOMIC STATUS[d]						
Low SES	40,900	11.2	9.8-12.5	50,900	14.3	12.8-15.9
High SES	63,200	7.5	6.8-8.3	64,900	7.4	6.7-8.1
RESIDENCE[e]						
Metropolitan	66,100	8.9	8.0-9.8	64,200	8.3	7.5-9.1
Nonmetropolitan	58,200	9.0	8.0-10.0	65,300	10.2	9.2-11.1

a. Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Annual household income from all sources.
d. Socioeconomic status based on educational attainment and annual household income. Low SES = Fewer than 12 years of education and a household income less than $25,000. High SES = 12 or more years of education and a household income of $25,000 or more.
e. Metro and non-metro status based on USDA 2003 Rural-Urban Continuum Codes. See Appendix C for a discussion of the methodology used during analyses.
Source: West Virginia Behavioral Risk Factor Surveillance System.

APPENDIX D – DETAILED TABLES

D1.4 Current Asthma[a] by County: Adults, WVBRFSS 2001-2005

County	Number[b]	%	95% CI	County Rank[c]	County vs. WV[d]	County vs. US[d]
Individual Counties						
Berkeley	5,600	9.9	7.4-12.4	14	h	h
Brooke	1,500	7.5	3.3-11.6	29	l	l
Cabell	6,900	8.9	6.5-11.3	18	l	h
Fayette	3,100	8.3	5.6-11.0	24	l	h
Hancock	2,600	10.1	5.9-14.4	12	h	h
Harrison	4,500	8.6	6.3-10.9	20	l	h
Jefferson	3,400	10.6	7.2-14.1	9	h	h
Kanawha	12,700	8.1	6.7-9.5	25	l	h
Logan	3,400	11.7	7.9-15.5	4	h	h
McDowell	2,600	12.7	8.1-17.2	1	h	H
Marion	4,800	10.8	7.5-14.1	8	h	h
Marshall	2,000	7.4	3.8-11.0	30	l	l
Mason	1,500	7.3	3.9-10.7	31	l	l
Mercer	5,000	10.1	7.1-13.0	12	h	h
Mingo	2,700	12.7	8.8-16.7	1	h	H
Monongalia	6,100	9.2	6.5-11.9	15	h	h
Ohio	3,200	8.6	5.1-12.1	20	l	h
Putnam	3,000	7.9	5.3-10.4	27	l	h
Raleigh	6,800	11.0	8.3-13.7	6	h	H
Randolph	1,500	7.0	3.5-10.4	34	l	l
Upshur	1,200	6.5	3.2-9.8	35	l	l
Wayne	2,800	8.6	5.5-11.8	20	l	h
Wood	4,900	7.3	5.3-9.2	31	l	l
Wyoming	1,700	8.6	4.4-12.7	20	l	h
Grouped Counties[e]						
Boone, Lincoln	4,100	11.2	8.2-14.1	5	h	H
Greenbrier, Summers, Monroe	4,400	9.0	6.5-11.6	17	l	h
Braxton, Nicholas, Webster	3,600	9.1	6.4-11.9	16	l	h
Hardy, Pendleton, Pocahontas	1,800	7.6	4.1-11.1	28	l	l
Calhoun, Clay, Gilmer, Roane	3,900	12.7	8.4-17.0	1	h	H
Jackson, Wirt	1,800	7.2	4.3-10.1	33	l	l
Doddridge, Lewis, Ritchie	2,900	11.0	7.0-15.0	6	h	h
Pleasants, Tyler, Wetzel	2,800	10.5	6.6-14.3	10	h	h
Barbour, Taylor	2,000	8.1	5.0-11.2	25	l	h
Preston, Tucker	2,500	8.9	5.3-12.6	18	l	h
Grant, Mineral	3,100	10.5	6.5-14.5	10	h	h
Hampshire, Morgan	1,500	5.8	3.3-8.3	36	L	l
Total WV (2001-2005)	128,900	9.2	8.7-9.7			H
Total US (2003)	16,640,200	7.7	7.5-7.9			

a. Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Counties ranked from 1 (highest prevalence) to 36 (lowest prevalence). Counties with the same prevalence share the same rank.
d. H = Significantly higher; h = Higher but not significantly higher; l = Lower but not significantly lower; L = Significantly Lower.
e. Some counties were grouped for analysis. These estimates are representative of the multi-county region. Individual county estimates are not available for grouped counties. See Appendix C for a discussion on the methodology used during analyses.
Data Source: West Virginia Behavioral Risk Factor Surveillance System.

D1.5 Lifetime and Current Asthma: Children, NSCH 2003

LIFETIME ASTHMA[a]						
Year	West Virginia			United States		
	Number[c]	%	95% CI	Number[c]	%	95% CI
TOTAL	52,400	13.5	11.7-15.3	9,040,300	12.5	12.1-12.8
GENDER						
Male	28,400	14.3	11.7-16.9	5,400,000	14.6	14.0-15.1
Female	24,000	12.7	10.1-15.3	3,636,500	10.3	9.8-10.7
AGE						
0-4	8,400	8.3	5.4-11.2	1,624,600	8.3	7.6-8.9
5-9	15,300	15.2	11.3-19.1	2,606,300	13.2	12.5-14.0
10-13	13,700	14.4	10.7-18.2	2,357,000	14.0	13.2-14.7
14-17	15,000	16.4	12.3-20.4	2,452,400	15.0	14.3-15.8
CURRENT ASTHMA[b]						
Year	West Virginia			United States		
	Number[c]	%	95% CI	Number[c]	%	95% CI
TOTAL	43,100	11.1	9.4-12.8	6,433,200	8.9	8.6-9.2
GENDER						
Male	22,800	11.5	9.1-13.9	3,793,800	10.3	9.8-10.8
Female	20,300	10.7	8.3-13.1	2,635,800	7.5	7.0-7.9
AGE						
0-4	7,500	7.5	4.8-10.1	1,195,000	6.1	5.5-6.6
5-9	12,500	12.5	8.9-16.0	1,910,600	9.7	9.1-10.4
10-13	11,600	12.2	8.6-15.8	1,714,800	10.2	9.5-10.9
14-17	11,400	12.5	8.7-16.2	1,612,700	9.9	9.3-10.6

a. Lifetime Asthma = Responding "yes" to "Has a doctor or health professional ever told you that [child] has…Asthma?"
b. Current Asthma = Responding "yes" to both "Has a doctor or health professional ever told you that [child] has…Asthma?" and "Does [child] still have asthma?"
c. Estimated number of children with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
Data Source: National Survey of Children's Health, 2003.

D1.6 Lifetime and Current Asthma: Children, WVBRFSS

LIFETIME ASTHMA[a]						
Year	2005			2006		
	Number[c]	%	95% CI	Number[c]	%	95% CI
TOTAL	48,300	12.6	10.3-15.0	42,100	11.3	9.1-13.5
Male	28,700	14.8	11.2-18.3	23,900	12.7	9.4-15.9
Female	19,500	10.5	7.5-13.5	18,200	9.9	7.0-12.8
CURRENT ASTHMA[b]						
Year	2005			2006		
	Number[c]	%	95% CI	Number[c]	%	95% CI
TOTAL	32,500	8.5	6.6-10.5	31,100	8.4	6.4-10.3
Male	18,200	9.3	6.5-12.2	18,000	9.6	6.7-12.5
Female	14,300	7.7	5.1-10.4	13,100	7.1	4.6-9.6

a. Lifetime Asthma = Responding "yes" to "Has a doctor, nurse, or other medical professional ever said that the child has asthma?"
b. Current Asthma = Responding "yes" to both "Has a doctor, nurse, or medical professional ever said that the child has asthma?" and "Does the child still have asthma?"
c. Estimated number of children with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
Data Source: West Virginia Behavioral Risk Factor Surveillance System.

APPENDIX D – DETAILED TABLES

D1.7 Lifetime and Current Asthma: Public Middle School and High School Students, WVYTS

LIFETIME ASTHMA									
Year	Middle School 2002[a]			High School 2002[b]			High School 2005[b]		
	Number[d]	%	95% CI	Number[d]	%	95% CI	Number[d]	%	95% CI
TOTAL	13,400	23.2	22.0-24.4	17,500	23.8	20.2-27.4	17,300	23.2	19.9-26.5
GENDER									
Male	7,100	24.2	22.6-25.8	9,300	25.1	20.7-29.5	8,900	23.7	19.6-27.8
Female	6,200	22.0	20.5-23.5	8,200	22.5	18.7-26.3	8,200	22.4	17.9-26.9
GRADE									
6th	4,500	23.8	21.8-25.8						
7th	4,300	22.1	20.2-24.0						
8th	4,500	23.7	22.2-25.2						
9th				5,000	25.2	21.1-29.3	5,000	22.7	16.0-29.4
10th				4,700	24.6	19.7-29.5	4,400	24.0	19.6-28.4
11th				3,100	17.1	13.1-21.1	3,700	21.4	16.3-26.5
12th				4,600	28.5	19.9-37.1	4,100	24.9	20.2-29.6

CURRENT ASTHMA									
Year	Middle School 2002			High School 2002[c]			High School 2005[c]		
	Number[d]	%	95% CI	Number[d]	%	95% CI	Number[d]	%	95% CI
TOTAL	Current asthma cannot be calculated for middle school students.			9,300	13.1	10.0-16.2	9,300	12.9	10.5-15.3
GENDER									
Male				4,600	12.9	9.3-16.5	4,300	12.0	9.1-14.9
Female				4,700	13.5	10.1-16.9	4,900	13.9	9.9-17.9
GRADE									
9th				2,700	14.5	10.4-18.6	1,900	9.2	5.1-13.3
10th				2,600	14.4	10.2-18.6	2,800	16.0	12.3-19.7
11th				1,700	9.8	6.1-13.5	1,900	11.6	9.4-13.8
12th				2,200	13.8	5.7-21.9	2,600	16.3	11.7-20.9

a. Middle School Lifetime Asthma = Responding "yes" to "Has Have you ever been told by a doctor that you have asthma?"
b. High School Lifetime Asthma = Responding "yes" to either "Have you ever been told by a doctor that you have asthma?" or "Have you ever been told by a health professional that you have asthma?"
c. High School Current Asthma = Responding "yes" to either "Have you ever been told by a doctor that you have asthma?" or "Have you ever been told by a health professional that you have asthma?" and "Do you still have asthma?"
d. Estimated number of students with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
Note: Middle school students not surveyed in 2005.
Data Source: West Virginia Youth Tobacco Survey.

D1.8 Lifetime Asthma[a] by Region: Public Middle School Students, WVYTS 2002

Region	Number[b]	%	95% CI	County Rank[c]	County vs. WV[d]
Eastern Panhandle Berkeley, Grant, Hampshire, Hardy, Jefferson, Mineral, Morgan, Pendleton	1,400	18.6	16.2-21.0	8	L
Greenbrier Valley Braxton, Fayette, Greenbrier, Nicholas, Pocahontas, Webster	1,100	25.6	20.4-30.8	2	h
Kanawha Valley Boone, Clay, Kanawha, Putnam	2,100	23.8	21.0-26.6	5	h
Mid-Ohio Valley Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, Wood	1,200	19.5	18.1-20.9	6	L
North Central Barbour, Doddridge, Gilmer, Harrison, Lewis, Marion, Monongalia, Preston, Randolph, Taylor, Tucker, Upshur	2,600	24.3	20.8-27.8	4	h
Northern Panhandle Brooke, Hancock, Marshall, Ohio, Wetzel	900	19.0	16.7-21.3	7	L
Southern Coalfield McDowell, Mercer, Monroe, Raleigh, Summers, Wyoming	1,800	25.4	20.6-30.3	3	h
Western Cabell, Lincoln, Logan, Mason, Mingo, Wayne	2,100	27.8	25.3-30.3	1	H
TOTAL WV	13,400	23.2	22.0-24.4		

a. Middle School Lifetime Asthma = Responding "yes" to "Has Have you ever been told by a doctor that you have asthma?"
b. Estimated number of public middle school students with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Regions ranked from 1 (highest prevalence) to 8 (lowest prevalence).
d. H = Significantly higher; h = Higher but not significantly higher; l = Lower but not significantly lower; L = Significantly Lower.
Note: These estimates are representative of the multi-county region. Individual county estimates are not available.
Data Source: West Virginia Youth Tobacco Survey.

D1.9 Current Asthma[a] by State: Adults, BRFSS 2006

State	Number[b]	%	95% CI	State Rank[c]	State vs. US[d]
Alabama	305,700	8.9	7.5-10.2	14	h
Alaska	44,800	9.5	7.9-11.1	10	h
Arizona	385,700	8.9	7.4-10.4	14	h
Arkansas	159,300	7.6	6.8-8.4	41	l
California	2,031,500	7.6	6.7-8.4	41	l
Colorado	274,800	7.9	7.1-8.7	36	l
Connecticut	247,800	9.3	8.4-10.1	11	H
Delaware	62,500	9.6	8.2-11.0	8	h
District of Columbia	43,700	10.0	8.7-11.3	2	H
Florida	993,900	7.2	6.5-8.0	46	L
Georgia	531,000	8.0	7.1-8.8	35	l
Hawaii	77,900	8.1	7.1-9.0	34	l
Idaho	95,300	9.2	8.1-10.2	13	h
Illinois	790,100	8.3	7.3-9.3	30	h
Indiana	390,700	8.4	7.6-9.2	27	h
Iowa	147,700	6.5	5.7-7.3	50	L
Kansas	170,400	8.3	7.5-9.0	30	h
Kentucky	261,600	8.2	7.2-9.1	33	l
Louisiana	199,100	5.9	5.2-6.6	51	L
Maine	100,900	9.7	8.6-10.8	6	H
Maryland	372,900	8.9	8.0-9.8	14	h
Massachusetts	487,800	9.9	9.0-10.7	3	H
Michigan	723,100	9.6	8.6-10.5	8	H
Minnesota	304,200	7.8	6.7-8.8	37	l
Mississippi	150,900	6.9	6.1-7.8	48	L
Missouri	380,400	8.6	7.4-9.9	22	h
Montana	59,800	8.3	7.3-9.2	30	h
Nebraska	98,600	7.5	6.5-8.4	44	l
Nevada	138,400	7.7	6.4-9.0	38	l
New Hampshire	97,500	9.7	8.8-10.7	6	H
New Jersey	502,700	7.6	7.0-8.3	41	l
New Mexico	121,400	8.5	7.5-9.4	24	h
New York	1,240,400	8.5	7.6-9.4	24	h
North Carolina	444,400	6.8	6.2-7.3	49	L
North Dakota	34,800	7.1	5.9-8.2	47	l
Ohio	842,200	9.8	8.1-11.4	4	h
Oklahoma	236,400	8.9	8.0-9.7	14	h
Oregon	272,400	9.8	8.8-10.9	4	H
Pennsylvania	845,900	8.8	7.9-9.7	19	h
Rhode Island	89,200	10.5	9.3-11.8	1	H
South Carolina	246,700	7.7	6.9-8.4	38	l
South Dakota	45,000	7.7	6.8-8.6	38	l
Tennessee	386,300	8.5	7.3-9.6	24	h
Texas	1,209,900	7.3	6.0-8.6	45	l
Utah	143,100	8.4	7.3-9.5	27	h
Vermont	45,400	9.3	8.4-10.1	11	H
Virginia	484,600	8.4	7.2-9.7	27	h
Washington	424,600	8.9	8.4-9.4	14	h
West Virginia	122,900	8.6	7.4-9.7	22	h
Wisconsin	371,800	8.8	7.5-10.0	19	h
Wyoming	34,100	8.7	7.7-9.7	21	h
Total US	18,272,400	8.2	8.0-8.4		

a. Current Asthma = Responding "yes" to "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. States ranked from 1 (highest prevalence) to 51 (lowest prevalence). States with the same prevalence share the same rank.
d. H = Significantly higher; h = Higher but not significantly higher; l = Lower but not significantly lower; L = Significantly Lower.
Data Source: Behavioral Risk Factor Surveillance System.

APPENDIX D – DETAILED TABLES

D1.10 Current Asthma[a] by State: Children, NSCH 2003

State	Number[b]	%	95% CI	State Rank[c]	State vs. US[d]
Alabama	105,500	9.6	8.0-11.2	17	h
Alaska	15,500	8.3	6.8-9.9	33	I
Arizona	129,700	8.6	7.2-10.1	28	I
Arkansas	55,900	8.3	6.8-9.8	33	I
California	698,600	7.5	6.1-8.9	39	I
Colorado	88,200	7.7	6.3-9.2	37	I
Connecticut	71,900	8.7	7.3-10.1	26	I
Delaware	23,600	11.9	10.3-13.6	1	H
District of Columbia	12,600	11.8	10.0-13.6	3	H
Florida	369,700	9.5	7.9-11.1	19	h
Georgia	219,300	9.6	8.0-11.3	17	h
Hawaii	35,000	11.9	10.1-13.7	1	H
Idaho	20,900	5.7	4.5-6.9	51	L
Illinois	245,200	7.7	6.3-9.1	37	I
Indiana	174,100	10.9	9.2-12.7	5	h
Iowa	45,100	6.6	5.3-7.8	44	L
Kansas	73,500	10.7	8.9-12.5	6	h
Kentucky	101,200	10.3	8.6-11.9	10	h
Louisiana	125,600	10.7	9.0-12.5	6	h
Maine	30,400	10.7	9.1-12.3	6	h
Maryland	143,000	10.5	8.8-12.1	9	h
Massachusetts	151,700	10.3	8.7-11.9	10	h
Michigan	253,600	10.1	8.5-11.6	12	h
Minnesota	76,900	6.2	4.9-7.5	48	L
Mississippi	68,900	9.1	7.5-10.7	22	h
Missouri	121,300	8.7	7.3-10.1	26	I
Montana	15,300	7.2	5.8-8.5	41	L
Nebraska	29,600	6.8	5.4-8.1	43	L
Nevada	40,200	7.0	5.7-8.3	42	L
New Hampshire	24,200	8.0	6.7-9.3	36	I
New Jersey	180,200	8.5	7.1-10.0	30	I
New Mexico	44,100	8.9	7.3-10.5	24	I
New York	447,900	10.0	8.4-11.7	14	h
North Carolina	186,800	9.0	7.5-10.6	23	h
North Dakota	9,700	6.6	5.4-7.9	44	L
Ohio	279,500	10.0	8.5-11.5	14	h
Oklahoma	80,200	9.2	7.7-10.8	21	h
Oregon	54,800	6.5	5.2-7.8	46	L
Pennsylvania	235,200	8.4	7.0-9.8	31	I
Rhode Island	24,500	10.1	8.5-11.8	12	h
South Carolina	93,900	9.3	7.7-10.9	20	h
South Dakota	11,100	5.8	4.3-7.2	50	L
Tennessee	118,200	8.6	7.0-10.2	28	I
Texas	618,100	10.0	8.5-11.5	14	h
Utah	46,100	6.2	4.8-7.7	48	L
Vermont	11,000	8.1	6.6-9.6	35	I
Virginia	149,300	8.4	7.0-9.7	31	I
Washington	110,000	7.4	6.0-8.9	40	I
West Virginia	43,100	11.1	9.4-12.8	4	H
Wisconsin	115,700	8.8	7.2-10.3	25	I
Wyoming	7,800	6.5	5.2-7.7	46	L
Total US	6,433,200	8.9	8.6-9.2		

a. Current Asthma = Responding "yes" to both "Has a doctor or health professional ever told you that [child] has…Asthma?" and "Does [child] still have asthma?"
b. Estimated number of children with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. States ranked from 1 (highest prevalence) to 51 (lowest prevalence). States with the same prevalence share the same rank.
d. H = Significantly higher; h = Higher but not significantly higher; I = Lower but not significantly lower; L = Significantly Lower.
Data Source: National Survey of Children's Health, 2003.

APPENDIX D – DETAILED TABLES

CHAPTER 2 – ASTHMA SYMPTOMS AND DISEASE MANAGEMENT

D2.1 Symptoms and Medication Use: Adults with Current Asthma[a], WVBRFSS

	2005			2006		
	Number[b]	%	95% CI	Number[b]	%	95% CI
Asthma Attack in Past 12 Months[c]	62,700	49.4	42.7-56.0	62,100	52.7	45.6-59.9
Asthma Symptoms in Past 30 Days[d]						
Never	35,500	29.0	23.1-35.0	28,900	24.6	19.2-30.1
<1 time per week	22,400	18.3	13.1-23.5	26,000	22.2	16.1-28.2
1-2 times per week	15,100	12.3	8.1-16.5	15,000	12.8	8.8-16.8
>2 times per week, not everyday	17,500	14.3	9.7-19.0	20,200	17.2	10.2-24.2
Every day	31,700	26.0	19.4-32.6	27,100	23.2	17.1-29.2
Sleep Disturbances in Past 30 Days[e]						
0 days	38,800	43.1	35.0-51.1	42,700	48.7	39.7-57.7
1-4 days	27,300	30.3	22.5-38.2	25,700	29.3	21.2-37.4
≥5 days	23,900	26.6	19.7-33.4	19,300	22.0	14.8-29.3
Controller Med Use in Past 30 Days[f]						
0 days	57,000	45.0	38.2-51.8	48,500	41.0	34.1-47.8
1-24 days	22,900	18.0	13.0-23.1	16,200	13.7	9.3-18.1
25-30 days	46,800	36.9	30.8-43.1	53,700	45.3	38.0-52.7
Rescue Inhaler Use in Past 30 Days[g]						
Never or No Attack	62,200	50.0	43.2-56.7	51,300	44.0	36.9-51.1
1-4 times	27,900	22.4	17.0-27.7	28,200	24.2	16.8-31.6
5-29 times	17,900	14.4	9.9-18.9	19,300	16.6	11.6-21.5
≥30 times	16,500	13.3	8.9-17.6	17,800	15.2	11.0-19.4
Activity Limitation in Past Year[h]						
0 days	88,800	72.4	66.2-78.6	76,400	69.8	62.3-77.4
1-6 days	19,400	15.8	10.9-20.8	15,900	14.6	7.3-21.9
≥7 days	14,400	11.8	7.2-16.4	17,000	15.6	11.1-20.0
≥1 day	33,900	27.6	21.4-33.8	33,000	30.2	22.6-37.7

a. Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of adults. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Asthma Attack = Responding "yes" to "During the past 12 months, have you had an episode of asthma or an asthma attack?"
d. Asthma Symptoms = "Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness and phlegm production when you do not have a cold or respiratory infection. During the past 30 days, how often did you have any symptoms of asthma?"
e. Asthma-Related Sleep Disturbances = "During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?"
f. Asthma Controller Medication Use = "During the past 30 days, how often did you take a prescription asthma medication to prevent an asthma attack from occurring?"
g. Asthma Rescue Inhaler Use = "During the past 30 days, how often did you use a prescription asthma inhaler during an asthma attack to stop it?"
h. Asthma-Related Activity Limitation = "During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?"
Data Source: West Virginia Behavioral Risk Factor Surveillance System.

APPENDIX D – DETAILED TABLES

D2.2 Asthma Symptoms and Disease Management: WV Children, NSCH 2003

Year	Current Asthma[a]			No Asthma		
	Number[b]	%	95% CI	Number[b]	%	95% CI
Asthma Attack in Past 12 Months[c]	25,800	59.9	51.7-68.2			
Last Asthma Medication Use[d]						
<1 day ago	16,100	37.5	29.8-45.2			
1-6 days ago	3,100	7.1*	2.0-12.3			
1 week to <3 months ago	10,100	23.5	16.6-30.3			
3-11 months ago	8,100	18.8	12.2-25.4			
≥1 year ago	5,600	13.0	6.8-19.3			
BMI Status[e]						
Underweight	2,100	5.3*	1.6-9.0	18,900	6.4	5.0-7.8
Normal	16,900	42.8	34.3-51.3	152,200	51.5	48.6-54.5
At Risk of Overweight	5,600	14.2	7.5-20.9	41,100	13.9	11.9-15.9
Overweight	14,900	37.7	29.5-45.9	83,100	28.1	25.4-30.8
Missed School Days Past 12 Mnths[f]						
0 days	2,400	7.3	3.4-11.3	40,400	17.5	14.9-20.0
1-5 days	15,400	47.4	37.8-56.9	145,200	62.8	59.5-66.1
6-10 days	8,600	26.4	18.2-34.6	28,100	12.1	9.9-14.4
≥11 days	6,200	18.9	11.1-26.7	17,600	7.6	5.6-9.6
≥1 day	30,200	92.7	88.7-96.6	190,800	82.5	80.0-85.1
Fair or Poor Health[g]	5,700	13.2	7.0-19.4	8,100	2.4	1.6-3.1

a. Current Asthma = Responding "yes" to both "Has a doctor or health professional ever told you that [child] has…Asthma?" and "Does [child] still have asthma?"
b. Estimated number of children. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Asthma Attack = Responding "yes" to "During the past 12 months, has [CHILD] had an episode of asthma or an asthma attack?"
d. Last Asthma Medication Use = "How long has it been since [he/she] last took asthma medication?"
e. BMI = Body Mass Index equals weight in kilograms divided by height in meters squared. Child BMI is plotted on sex-specific BMI-for-age growth charts to obtain a percentile ranking. Underweight = <5th percentile; Normal = 5th percentile to <85th percentile; At Risk of Overweight = 85th percentile to <95th percentile; Overweight = ≥95th percentile.
f. Missed School Days = "During the past 12 months, about how many days did [CHILD] miss school because of illness or injury?"
g. Fair or Poor Health = Responding "fair" or "poor" to "In general, how would you describe [CHILD'S] health? Would you say [his/her] health is excellent, very good, good, fair, or poor?"
* Use caution in interpreting this estimate. It does not meet one or more of the reliability criteria (see Appendix C for a discussion of reliability criteria).
Data Source: National Survey of Children's Health, 2003.

D2.3 Asthma Severity: Adults with Current Asthma[a], WVBRFSS 2005-2006

	Number[b]	%	95% CI
Severity Classification[c]			
Severe Persistent	21,100	27.1	21.4-32.9
Moderate Persistent	20,100	25.7	19.4-32.1
Mild Persistent	18,000	23.1	17.7-28.5
Mild Intermittent	18,700	24.0	18.7-29.3
Medication Use[d,e] in Past 30 Days by Severity Classification			
Severe Persistent			
Controller Med Use	14,900	70.7	58.0-83.3
Rescue Inhaler Use	15,900	76.4	63.9-88.9
Moderate Persistent			
Controller Med Use	14,900	74.8	63.3-86.3
Rescue Inhaler Use	13,200	68.0	53.7-82.3
Mild Persistent			
Controller Med Use	10,400	58.1	44.7-71.4
Rescue Inhaler Use	10,900	61.5	48.2-74.8
Mild Intermittent			
Controller Med Use	9,900	52.7	40.5-64.9
Rescue Inhaler Use	8,600	46.3	33.9-58.7

a. Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of adults. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Severity Classification = Assigned based on responses to survey questions about symptoms, sleep disturbances, medication use, and activity limitations. See Appendix C for a discussion of the methodology used to assign severity. Note: This methodology may underestimate asthma severity.
d. Asthma Controller Medication Use = "During the past 30 days, how often did you take a prescription asthma medication to prevent an asthma attack from occurring?"
e. Asthma Rescue Inhaler Use = "During the past 30 days, how often did you use a prescription asthma inhaler during an asthma attack to stop it?"
Data Source: West Virginia Behavioral Risk Factor Surveillance System.

D2.4 Risk Factors and Quality of Life by Asthma Status: Adults, WVBRFSS

2003-2005						
	Current Asthma[a]			No Asthma		
	Number[b]	%	95% CI	Number[b]	%	95% CI
BMI Status[c]						
Normal	40,000	31.5	28.1-35.0	458,900	36.8	35.6-37.9
Overweight	38,100	30.0	26.7-33.3	444,600	35.6	34.5-36.8
Obese	48,800	38.5	34.9-42.0	344,700	27.6	26.5-28.7
Current Cigarette Smoker[d]	44,700	34.5	31.0-38.1	335,600	26.1	25.1-27.2
Smoking Allowed in Home[e]	54,800	43.1	39.5-46.7	478,800	37.8	36.6-39.0
Smoking Allowed at Work[f]	6,900	16.4	11.2-21.5	83,900	16.6	15.1-18.0
≥1 Poor Physical Health Days in Past 30 Days[g]	80,600	63.8	60.3-67.3	484,200	38.2	37.1-39.4
≥1 Poor Mental Health Days in Past 30 Days[h]	62,800	49.5	45.9-53.2	427,700	33.8	32.7-35.0
Fair or Poor Health[i]	58,200	45.0	41.4-48.6	287,900	22.4	21.5-23.4
2000-2002						
	Current Asthma[a]			No Asthma		
	Number[b]	%	95% CI	Number[b]	%	95% CI
Smoking Allowed in Home[e]	39,800	48.7	44.2-53.3	374,000	46.8	45.3-48.3
Smoking Allowed at Work[f]	8,400	19.5	13.9-25.0	116,200	23.4	21.6-25.1

a. Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of adults. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. BMI = Body Mass Index equals weight in kilograms divided by height in meters squared. Normal = BMI <25.0. Overweight = BMI 25.0-29.9. Obese = BMI ≥30.0.
d. Current Cigarette Smoking = Responding "yes" to "Have you ever smoked 100 cigarettes in your entire life?" and responding "every day" or "some days" to "Do you now smoke cigarettes every day, some days, or not at all?"
e. Smoking Allowed in Home = Responded "Smoking is allowed in some places or at some times" or "Smoking is allowed anywhere inside the home" or "There are no rules about smoking inside the home" to "Which statement best describes the rules about smoking inside your home?"
f. Smoking Allowed at Work = Responded "Allowed in some public areas" or "Allowed in all public areas" to "Which of the following best describes your place of works official smoking policy for indoor public or common areas, such as lobbies, rest rooms, and lunch rooms?" or responded "Allowed in some work areas" or "Allowed in all work areas" to "Which of the following best describes your place of works official smoking policy for work areas?"
g. Poor Physical Health Days = Responded "1" to "30" to "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?"
h. Poor Mental Health Days = Responded "1" to "30" to "Now thinking about your physical health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"
i. Fair or Poor Health = Responding "fair" or "poor" to "Would you say that in general your health is excellent, very good, good, fair, or poor?"
Data Source: West Virginia Behavioral Risk Factor Surveillance System.

D2.5 Symptoms, Disease Management, and Risk Factors: High School Students[a], WVYTS

	2002			2005		
	Number[b]	%	95% CI	Number[b]	%	95% CI
Asthma Attack in Past 12 Months[c]	5,200	63.6	57.2-70.0	5,200	58.5*	45.5-71.5
Current Asthma Prescription Medication Use[d]	4,900	56.5*	46.2-66.8	5,300	58.6*	47.2-70.0
Asthma-Related Missed School Days in Past Year[e]						
0 days	4,700	54.9*	42.8-67.0	5,500	63.0	53.1-72.9
1-5 days	1,300	15.6	10.7-20.5	2,000	23.0	16.2-29.8
6-10 days	900	10.2	4.5-15.9	400	4.5*	1.7-7.3
≥11 days	1,600	19.3*	8.7-29.9	800	9.5*	3.2-15.8
≥1 day	3,800	45.1	33.0-57.2	3,200	37.0	27.1-46.9
	Current Asthma[f] 2005			**No Asthma 2005**		
	Number[c]	%	95% CI	Number[c]	%	95% CI
Current Cigarette Smoker[g]	2,900	31.3*	20.6-42.0	16,500	26.8	22.7-30.9
ETS Exposure Past Week						
In Room with Smoker[h]	6,500	70.4	62.8-78.0	45,700	74.4	70.5-78.3
In Car with Smoker[i]	5,300	57.4	49.3-65.5	33,600	53.9	49.8-58.0
In Room or Car with Smoker	6,900	74.9	66.3-83.5	47,400	76.3	72.5-80.1

a. High School Students = West Virginia public high school students.
b. Estimated number of public high school students. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Asthma Attack among Students with Current Asthma = Responding "yes" to "Have you had an asthma attack or episode of asthma in the past 12 months?"
d. Current Asthma Medication Use among Students with Current Asthma = Responding "yes" to "Are you currently taking prescription medicine for asthma?"
e. Missed School Days among Students with Current Asthma = "During this school year, how many days of school did you miss due to your asthma?"
f. Current Asthma = Responding "yes" to either "Have you ever been told by a doctor that you have asthma?" or "Have you ever been told by a health professional that you have asthma?" and "Do you still have asthma?"
g. Current Cigarette Smoker = Responded "1-30 days" to "During the past 30 days, on how many days did you smoke cigarettes?"
h. In Room with Smoker = Responded "1-7 days" to "During the past seven days, on how many days were you in the same room with someone who was smoking?"
i. In Car with Smoker = Responded "1-7 days" to "During the past seven days, on how many days did you ride in a car with someone who was smoking cigarettes?"
* Use caution in interpreting this estimate. It does not meet one or more of the reliability criteria (see Appendix C for a discussion of reliability criteria).
Data Source: West Virginia Youth Tobacco Survey.

D2.6 Asthma Status by Cigarette Smoking Status

Year	WV Public High School Students 2005			WV Adults (age 18+) 2003-2005		
	Number[a]	%	95% CI	Number[a]	%	95% CI
Nonsmokers						
Current Asthma[b]	6,300	12.3	9.7-14.9	84,700	8.2	7.5-8.9
No Asthma	45,200	87.7	85.1-90.3	949,300	91.8	91.1-92.5
Current Smokers[c]						
Current Asthma[b]	2,900	14.8	9.5-20.1	44,700	11.7	10.3-13.2
No Asthma	16,500	85.2	79.9-90.5	335,600	88.3	86.8-89.7

a. Estimated number of public high school students/adults. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
b. High School Current Asthma = Responding "yes" to either "Have you ever been told by a doctor that you have asthma?" or "Have you ever been told by a health professional that you have asthma?" and "Do you still have asthma?"
Adult Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
c. High School Current Smokers = "1-30 days" to "During the past 30 days, on how many days did you smoke cigarettes?"
Adult Current Smokers = Responding "yes" to "Have you ever smoked 100 cigarettes in your entire life?" and responding "every day" or "some days" to "Do you now smoke cigarettes every day, some days, or not at all?"
Data Sources: West Virginia Youth Tobacco Survey, 2005; West Virginia Behavioral Risk Factor Surveillance System, 2003-2005.

APPENDIX D – DETAILED TABLES

CHAPTER 3 – HEALTH CARE ACCESS AND UTILIZATION

D3.1 Health Care Access and Utilization by Asthma Status: WV Children and Adults

	Current Asthma[a]			No Asthma		
	Number[b]	%	95% CI	Number[b]	%	95% CI
No Health Care Coverage[e]						
Children[c] 2003	2,200	5.5*	1.3-9.6	22,800	6.8	5.3-8.2
Adults[d] 2003-2005	26,300	20.3	17.1-23.5	234,800	18.3	17.3-19.3
No Personal Doctor[f]						
Children 2003	2,284	5.4*	1.2-9.5	45,800	13.3	11.4-15.2
Adults 2003-2005	21,300	16.4	13.4-19.5	294,400	22.9	21.8-24.0
Type of Health Care Coverage, Children[g] 2003						
Public	21,100	52.4	44.1-60.8	119,400	35.4	32.6-38.2
Private	16,900	42.1	34.1-50.1	195,300	57.9	55.1-60.7
None	2,200	5.5*	1.3-9.6	22,800	6.8	5.3-8.2
Health Care Visits in Past 12 Months, Children 2003						
≥1 Preventive Visit[h]	36,800	85.8	79.3-92.4	277,400	81.7	79.6-83.8
≥1 Sick Visit[i]	34,100	80.1	73.2-87.0	221,300	65.0	62.4-67.7
≥1 Emergency Room Visit[j]	17,000	39.8	31.8-47.9	78,800	23.0	20.6-25.3
≥1 Asthma Hospital Stay[k]	1,700	4.0*	1.3-6.7			

a. Adult Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Child Current Asthma = Responding "yes" to both "Has a doctor or health professional ever told you that [child] has…Asthma?" and "Does [child] still have asthma?"
b. Estimated number of children/adults. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Children = West Virginia children age 17 and younger.
d. Adults = West Virginia adults age 18 and older.
e. Adult No Health Care Coverage = Responding "no" to "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?"
Child No Health Care Coverage = Derived variable from the following questions: "Does [CHILD] have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicaid?" and "Is [he/she] insured by Medicaid or the State Children's Health Insurance Program?"
f. Adult No Personal Doctor = Responding "no" to "Do you have one person you think of as your personal doctor or health care provider?"
Child No Personal Doctor = "Do you have one or more persons you think of as [CHILD]'s personal doctor or nurse?"
g. Child Type of Health Care Coverage = Derived variable from the following questions: "Does [CHILD] have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicaid?" and "Is [he/she] insured by Medicaid or the State Children's Health Insurance Program?"
h. Child Preventive Visit = Responded "1 or more times" to "During the past 12 months, how many times did [CHILD] see a doctor, nurse, or other health care professional for preventive medical care such as a physical exam or well-child check-up?"
i. Child Sick Visit = Responded "1 or more times" to "Excluding emergency room visits, hospitalizations, and well-child care, how many times during the past 12 months did [he/she] see a doctor, nurse, or other health care professional for sick-child care?"
j. Child ER Visit = Responded "1 or more times" to "During the past 12 months, how many times did [CHILD] go to a hospital emergency room about [his/her] health? This includes emergency room visits that resulted in a hospital admission."
k. Child Asthma Hospital Visit = Responded "yes" to "During the past 12 months, has [CHILD] stayed overnight in a hospital because of [his/her] asthma?" This question was asked only about children who had ever been diagnosed with asthma.
* Use caution in interpreting this estimate. It does not meet one or more of the reliability criteria (see Appendix C for a discussion of reliability criteria).
Data Sources: National Survey of Children's Health, 2003; West Virginia Behavioral Risk Factor Surveillance System, 2003-2005.

APPENDIX D – DETAILED TABLES

D3.2 Asthma Health Care Visits: Adults with Current Asthma[a], WVBRFSS

Visits	2005			2006		
	Number[b]	%	95% CI	Number[b]	%	95% CI
≥1 Routine Asthma Visit[c]	72,100	56.6	49.9-63.3	65,900	56.2	49.2-63.2
≥1 Asthma Sick Visit[d]	33,000	26.5	21.0-32.1	29,700	24.9	19.2-30.6
≥1 Asthma ER Visit[e]	24,000	18.9	13.9-23.9	23,300	19.4	12.6-26.2

a. Current Asthma = Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of adults. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Routine Asthma Visit = Responded "1 or more times" to "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?"
d. Asthma Sick Visit = Responded "1 or more times" to "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?" Does not include emergency room visits.
e. Asthma ER Visit = Responded "1 or more times" to "During the past 12 months, how many times did you visit an emergency room or urgent care center because of your asthma?"
Data Source: West Virginia Behavioral Risk Factor Surveillance System.

D3.3 West Virginia Asthma Hospitalization Rates by Gender

Year	Total			Male			Female		
	Number[a]	Crude[b]	Age-Adj.[c]	Number[a]	Crude[b]	Age-Adj.[c]	Number[a]	Crude[b]	Age-Adj.[c]
1996	2,453	13.5	13.7	915	10.4	10.9	1,538	16.4	16.1
1997	2,141	11.8	12.2	814	9.2	9.9	1,327	14.2	14.2
1998	2,019	11.1	11.2	724	8.2	8.6	1,295	13.8	13.5
1999	2,336	12.9	13.1	798	9.1	9.6	1,583	16.5	16.2
2000	2,344	13.0	13.3	830	9.4	10.2	1,514	16.3	16.1
2001	2,396	13.3	13.5	849	9.7	10.4	1,547	16.7	16.2
2002	2,513	13.9	13.9	820	9.3	9.9	1,693	18.3	17.5
2003	3,471	19.2	18.9	1,207	13.7	14.5	2,264	24.4	22.8
2004	3,202	17.7	17.1	1,087	12.3	12.8	2,115	22.8	20.9
2005	3,078	16.9	16.2	931	10.5	10.8	2,147	23.1	21.1

a. Number = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx) among West Virginia residents; excludes newborn infants.
b. Crude rate per 10,000 population [(Number of hospitalizations / West Virginia resident population estimate)*10,000].
c. Age-adjusted rate per 10,000 population. Age-adjusted to the 2000 US Standard Population.
Note: US Census Bureau Intercensal Population Estimates were used to calculate 1996-1999 rates. US Census Bureau Vintage 2005 Population Estimates were used to calculate 2000-2005 rates.
Data Source: West Virginia Health Care Authority; West Virginia Health Statistics Center.

D3.4 United States Asthma Hospitalization Rates by Gender

Year	Total		Male		Female	
	Number[a]	Crude[b]	Number[a]	Crude[b]	Number[a]	Crude[b]
1996	474,000	17.9	195,000	15.1	279,000	20.6
1997	484,000	17.9	204,000	15.4	279,000	20.2
1998	423,000	15.5	168,000	12.6	255,000	18.3
1999	478,000	17.4	190,000	14.1	288,000	20.5
2000	465,000	16.7	198,000	14.5	267,000	18.8
2001	454,000	16.0	186,000	13.4	268,000	18.5
2002	484,000	16.8	196,000	13.9	288,000	19.7
2003	574,000	19.8	232,000	16.3	342,000	23.2
2004	497,000	17.0	207,000	14.5	290,000	19.4
2005	489,000	16.6	192,000	13.3	296,000	19.7

a. Number = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.
b. Crude rate per 10,000 population
Data Source: National Hospital Discharge Survey Reports.

D3.5 Asthma Hospitalization Rates by Age

West Virginia								
Year	< 15 years		15-44 years		45-64 years		≥ 65 years	
	Number[a]	Rate[b]	Number[a]	Rate[b]	Number[a]	Rate[b]	Number[a]	Rate[b]
1996	787	23.1	728	9.2	505	12.1	433	15.5
1997	805	23.9	590	7.6	416	9.8	330	11.8
1998	567	17.0	589	7.7	481	11.0	382	13.8
1999	663	20.0	672	8.9	559	12.5	442	16.0
2000	795	24.2	610	8.2	526	11.6	413	14.9
2001	719	22.2	614	8.3	565	12.1	498	18.0
2002	650	20.1	646	8.9	673	14.1	544	19.7
2003	845	26.5	816	11.3	927	18.9	883	31.8
2004	716	22.6	622	8.7	943	18.9	921	33.2
2005	627	20.0	619	8.7	939	18.4	893	32.1
United States								
Year	< 15 years		15-44 years		45-64 years		≥ 65 years	
	Number[a]	Rate[b]	Number[a]	Rate[b]	Number[a]	Rate[b]	Number[a]	Rate[b]
1996	195,500	33.8	132,000	11.1	88,000	16.4	59,000	17.4
1997	214,000	35.8	117,000	9.6	88,000	15.9	65,000	19.2
1998	166,000	27.7	104,000	8.6	92,000	16.2	60,000	17.7
1999	190,000	31.5	122,000	10.0	94,000	15.9	73,000	21.2
2000	203,000	33.6	111,000	9.1	84,000	13.7	68,000	19.6
2001	182,000	30.1	104,000	8.4	92,000	14.3	76,000	21.4
2002	187,000	30.8	109,000	8.7	109,000	16.3	80,000	22.5
2003	213,000	35.0	127,000	10.2	125,000	18.3	109,000	30.5
2004	190,000	31.2	91,000	7.3	112,000	15.9	104,000	28.7
2005	159,000	26.2	98,000	7.8	119,000	16.4	112,000	30.5

a. Number = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx) among West Virginia residents; excludes newborn infants.
b. Crude rate per 10,000 population [(Number of hospitalizations / resident population estimate)*10,000].
Note: US Census Bureau Intercensal Population Estimates were used to calculate West Virginia 1996-1999 rates. US Census Bureau Vintage 2005 Population Estimates were used to calculate West Virginia 2000-2005 rates.
Data Sources: West Virginia Health Care Authority; West Virginia Health Statistics Center. National Hospital Discharge Survey Reports.

D3.6 Average Length of Stay[a] of Asthma Hospitalizations

Year	West Virginia			United States		
	Total	Male	Female	Total	Male	Female
1996	3.7	3.1	4.1	3.6	3.2	3.9
1997	3.5	3.0	3.8	3.4	3.0	3.7
1998	3.5	2.9	3.8	3.3	2.7	3.7
1999	3.4	2.9	3.6	3.2	2.8	3.5
2000	3.6	2.9	4.1	3.0	2.6	3.4
2001	3.6	3.1	3.9	3.2	2.7	3.6
2002	3.6	2.9	4.0	3.2	2.7	3.5
2003	3.7	3.1	4.0	3.3	2.8	3.6
2004	3.9	3.3	4.2	3.2	2.8	3.5
2005	3.9	3.4	4.2	3.3	2.8	3.7

a. Average Length of Stay = Average number of days hospitalized with a primary diagnosis of asthma (ICD-9-CM 493.xx) among West Virginia residents.
Data Source: West Virginia Health Care Authority; West Virginia Health Statistics Center.

D3.7 West Virginia Asthma Hospitalizations by Primary Payor[a]

Year	Total	Medicare		Medicaid		Other Govt.		Non-govt.		Self/Charity		Other/ Unknown	
	#	#	%[b]	#	%[b]	#	%[b]	#	%[b]	#	%[b]	#	%[b]
1996	2,453	540	22.0	795	32.4	64	2.6	874	35.6	144	5.9	36	1.5
1997	2,141	453	21.2	750	35.0	57	2.7	708	33.1	137	6.4	36	1.7
1998	2,019	486	24.1	612	30.3	58	2.9	677	33.5	135	6.7	51	2.5
1999	2,336	571	24.4	710	30.4	70	3.0	758	32.4	143	6.1	84	3.6
2000	2,344	525	22.4	717	30.6	57	2.4	768	32.8	157	6.7	120	5.1
2001	2,396	636	26.5	649	27.1	68	2.8	769	32.1	164	6.8	110	4.6
2002	2,513	717	28.5	732	29.1	46	1.8	830	33.0	138	5.5	50	2.0
2003	3,471	1,124	32.4	958	27.6	86	2.5	1,042	30.0	196	5.6	65	1.9
2004	3,202	1,175	36.7	829	25.9	88	2.7	901	28.1	139	4.3	70	2.2
2005	3,078	1,184	38.5	732	23.8	74	2.4	884	28.7	139	4.5	65	2.1

a. Primary Payor = Expected main source of payment for hospitalizations with a primary diagnosis of asthma (ICD-9-CM 493.xx) among West Virginia residents. Excludes hospitalizations of newborn infants.
b. Percent of total yearly hospitalizations.
Data Source: West Virginia Health Care Authority; West Virginia Health Statistics Center.

D3.8 Charges for West Virginia Asthma Hospitalizations by Primary Payor[a]

Year	Total	Medicare	Medicaid	Other Govt.	Non-govt.	Self/Charity	Other/ Unknown
1996	10,348,464	3,275,776	3,040,813	266,144	3,148,428	463,221	154,081
1997	8,718,798	2,567,347	2,839,069	199,015	2,542,982	449,550	120,837
1998	8,660,564	3,032,602	2,295,653	272,456	2,421,907	459,949	177,997
1999	9,883,111	3,335,884	2,636,625	299,798	2,736,186	504,130	370,488
2000	10,997,596	3,359,491	3,078,229	251,515	2,981,749	753,158	573,454
2001	12,861,403	4,574,037	3,144,665	475,365	3,413,427	777,430	476,479
2002	14,297,357	5,532,715	3,908,580	228,814	3,728,819	650,312	248,117
2003	22,137,123	9,784,805	5,033,653	496,415	5,434,556	1,009,490	378,204
2004	22,598,387	10,716,927	4,960,472	661,893	5,099,213	767,864	392,018
2005	23,224,513	11,232,727	4,812,686	519,206	5,373,510	897,639	388,745

a. Primary Payor = Expected main source of payment for hospitalizations with a primary diagnosis of asthma (ICD-9-CM 493.xx) among West Virginia residents. Excludes hospitalizations of newborn infants.
Data Source: West Virginia Health Care Authority, UB-92 data; West Virginia Health Statistics Center.

D3.9 Average Annual Asthma Hospitalization Rates by Region, West Virginia 2003-2005

Region	Number[a]	Crude Rate[b]	Age-Adj.[c]
Eastern Panhandle Berkeley, Grant, Hampshire, Hardy, Jefferson, Mineral, Morgan, Pendleton	772	10.3	10.1
Greenbrier Valley Braxton, Fayette, Greenbrier, Nicholas, Pocahontas, Webster	1,058	24.9	23.9
Kanawha Valley Boone, Clay, Kanawha, Putnam	1,212	14.2	13.3
Mid-Ohio Valley Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, Wood	975	19.0	17.9
North Central Barbour, Doddridge, Gilmer, Harrison, Lewis, Marion, Monongalia, Preston, Randolph, Taylor, Tucker, Upshur	1,808	16.7	16.8
Northern Panhandle Brooke, Hancock, Marshall, Ohio, Wetzel	750	16.3	16.0
Southern Coalfield McDowell, Mercer, Monroe, Raleigh, Summers, Wyoming	1,489	22.8	22.5
Western Cabell, Lincoln, Logan, Mason, Mingo, Wayne	1,737	23.3	22.9
TOTAL	**9,751**	**17.9**	**17.4**

a. Number = Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx) among West Virginia residents; excludes newborn infants.
b. Crude rate per 10,000 population [(Number of hospitalizations / 2003-2005 average West Virginia resident population estimate)*10,000].
c. Age-adjusted rate per 10,000 population. Age-adjusted to the 2000 US Standard Population.
Note: US Census Bureau Vintage 2005 Population Estimates were used to calculate rates.
Data Source: West Virginia Health Care Authority, UB-92 data; West Virginia Health Statistics Center.

APPENDIX D – DETAILED TABLES

CHAPTER 7 – MORTALITY

D7.1 Age-adjusted Asthma Mortality Rates

Year	West Virginia			United States		
	Deaths[a]	Rate[b]	95% CI[c]	Deaths[a]	Rate[b]	95% CI[d]
2000	36	1.8	1.3-2.5	4,487	1.6	
2001	28	1.3	0.9-1.9	4,269	1.5	
2002	24	1.2	0.8-1.8	4,261	1.5	
2003	31	1.5	1.0-2.1	4,099	1.4	
2004	13	0.6*	0.3-1.0	3,780[e]	1.3[d]	
2005	30	1.4	0.9-2.0			

a. Deaths = Number of asthma deaths with a primary cause of asthma (ICD-10 493.xx).
b. Age-adjusted rate per 100,000 population. Age adjusted to the 2000 US Standard Population.
c. See Appendix C for the methodology used to calculate confidence intervals for West Virginia rates.
d. Confidence intervals for US rates are not included in the National Vital Statistics Reports.
e. Preliminary 2004 US death data.
* Be cautious when interpreting rates based on fewer than 20 deaths.
Note: 2005 US data not yet available. US Census Bureau Vintage 2005 Population Estimates were used to calculate West Virginia rates.
Data Sources: West Virginia = West Virginia Health Statistics Center; United States = National Vital Statistics Reports, National Center for Health Statistics.

D7.2 Average Annual Age-adjusted Asthma Mortality Rates by Gender, West Virginia

Years	Males			Females			Total		
	Deaths[a]	Rate[b]	95% CI[c]	Deaths[a]	Rate[b]	95% CI[c]	Deaths[a]	Rate[b]	95% CI[c]
2000-2002	28	1.0	0.7-1.5	60	1.8	1.4-2.3	88	1.4	1.1-1.7
2003-2005	14	0.5*	0.3-0.9	60	1.8	1.4-2.3	74	1.2	0.9-1.5
2000-2005	42	0.8	0.6-1.1	120	1.8	1.4-2.2	162	1.3	1.1-1.5

a. Deaths = Number of asthma deaths with a primary cause of asthma (ICD-10 493.xx) among West Virginia residents.
b. Age-adjusted rate per 100,000 population. Age-adjusted to the 2000 US Standard Population.
c. See Appendix C for the methodology used to calculate confidence intervals for West Virginia rates.
* Be cautious when interpreting rates based on fewer than 20 deaths.
Note: US Census Bureau Vintage 2005 Population Estimates were used to calculate West Virginia rates.
Data Source: West Virginia Health Statistics Center.

D7.3 Average Annual Asthma Mortality Rates by Age and Gender

WEST VIRGINIA 2000-2005									
Age Group	Males			Females			Total		
	Deaths[a]	Rate[b]	95% CI[c]	Deaths[a]	Rate[b]	95% CI[c]	Deaths[a]	Rate[b]	95% CI[c]
<15	2	0.2*	0.02-0.7	2	0.2*	0.02-0.7	4	0.2*	0.1-0.5
15-44	3	0.1*	0.02-0.3	22	1.0	0.6-1.5	25	0.6	0.4-0.9
45-64	12	0.8*	0.4-1.4	27	1.8	1.2-2.6	39	1.3	0.9-1.8
≥65+	25	3.6	2.3-5.3	69	7.1	5.5-9.0	94	5.7	4.6-7.0
<65	17	0.4*	0.2-0.6	51	1.1	0.8-1.5	68	0.7	0.6-0.9
Total	42	0.8	0.6-1.1	120	2.2	1.8-2.6	162	1.5	1.3-1.7
UNITED STATES 2000-2004									
Age Group	Males			Females			Total		
	Deaths[a]	Rate[b]	95% CI	Deaths[a]	Rate[b]	95% CI	Deaths[a]	Rate[b]	95% CI
<15	481	0.3	0.27-0.33	293	0.2	0.18-0.22	774	0.3	0.28-0.32
15-44	2,016	0.6	0.57-0.63	2,090	0.7	0.67-0.73	4,106	0.7	0.68-0.72
45-64	2,124	1.3	1.24-1.36	3,606	2.1	2.03-2.17	5,730	1.7	1.66-1.74
65+	2,949	4.0	3.86-4.14	7,373	7.1	6.94-7.26	10,322	5.8	5.69-5.91
Total	7,570	1.1	1.08-1.12	13,362	1.8	1.77-1.83	20,932	1.5	1.48-1.52

a. Deaths = Number of asthma deaths with a primary cause of asthma (ICD-10 493.xx).
b. Crude rate per 100,000 population. WV rate calculation = [(Number of deaths / 2000-2005 average West Virginia resident population estimate)*100,000].
c. See Appendix C for the methodology used to calculate confidence intervals for West Virginia rates.
* Be cautious when interpreting rates based on fewer than 20 deaths.
Note: US Census Bureau Vintage 2005 Population Estimates were used to calculate West Virginia rates.
Data Sources: West Virginia = West Virginia Health Statistics Center; United States = CDC Wonder (http://wonder.cdc.gov/).

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The Health Statistics Center (HSC) maintains West Virginia vital records and conducts the Behavioral Risk Factor Survey. The HSC can do customized reports and data analysis for grants, formal research, agency use, or specific community health planning activities. For additional information, call 558-9100 and ask for a Statistical Services staff member. Visit our website for electronic access to HSC reports and statistical briefs.