

VIRGINIA

2018

ASTHMA BURDEN REPORT

Summary:

Asthma is, and will continue to be, an important public health issue, considering its vast impact on health, quality of life and economic cost. In the U.S., the burden of asthma is huge; however, there are large disparities by sex, race/ethnicity and age. In Virginia, adult females, female children, blacks, and Hispanics are disproportionately affected by asthma. There were an estimated 874,713 people diagnosed with asthma at some point in their lifetime, out of an estimated population of 8,411,808 in 2016 (BRFSS, 2016) in the Commonwealth of Virginia. That is, one out of every ten adult residents in Virginia has been diagnosed with asthma in their lifetime. Also, an estimated 560,419 adults currently have asthma (BRFSS, 2016). This means one in fifteen adults in the Commonwealth of Virginia has asthma. This morbidity continues to greatly impact the cost of care and management of the disease, considering the number of individuals with asthma. Deaths due to asthma are rare and are thought to be largely preventable, particularly among children and young adults. Asthma related deaths are a testament to a lack of patient education, limited access to preventive medications and/or poor quality of care.

Introduction:

Asthma is a chronic disease of the lungs that is characterized by wheezing, coughing at night or early in the morning, chest tightness, and breathlessness; resulting in fatigue and lifelong restrictions in activities of daily living. It is an inflammatory disorder of the respiratory passage which results in a narrowing of the airways that carry oxygen to the lungs and is often reversible. Often starting during childhood, asthma is not curable, rather, it is a manageable condition and often decreases in severity over time. However, the cost of medication is an obstacle to optimal asthma care, particularly for disadvantage populations.

Key Asthma Facts:

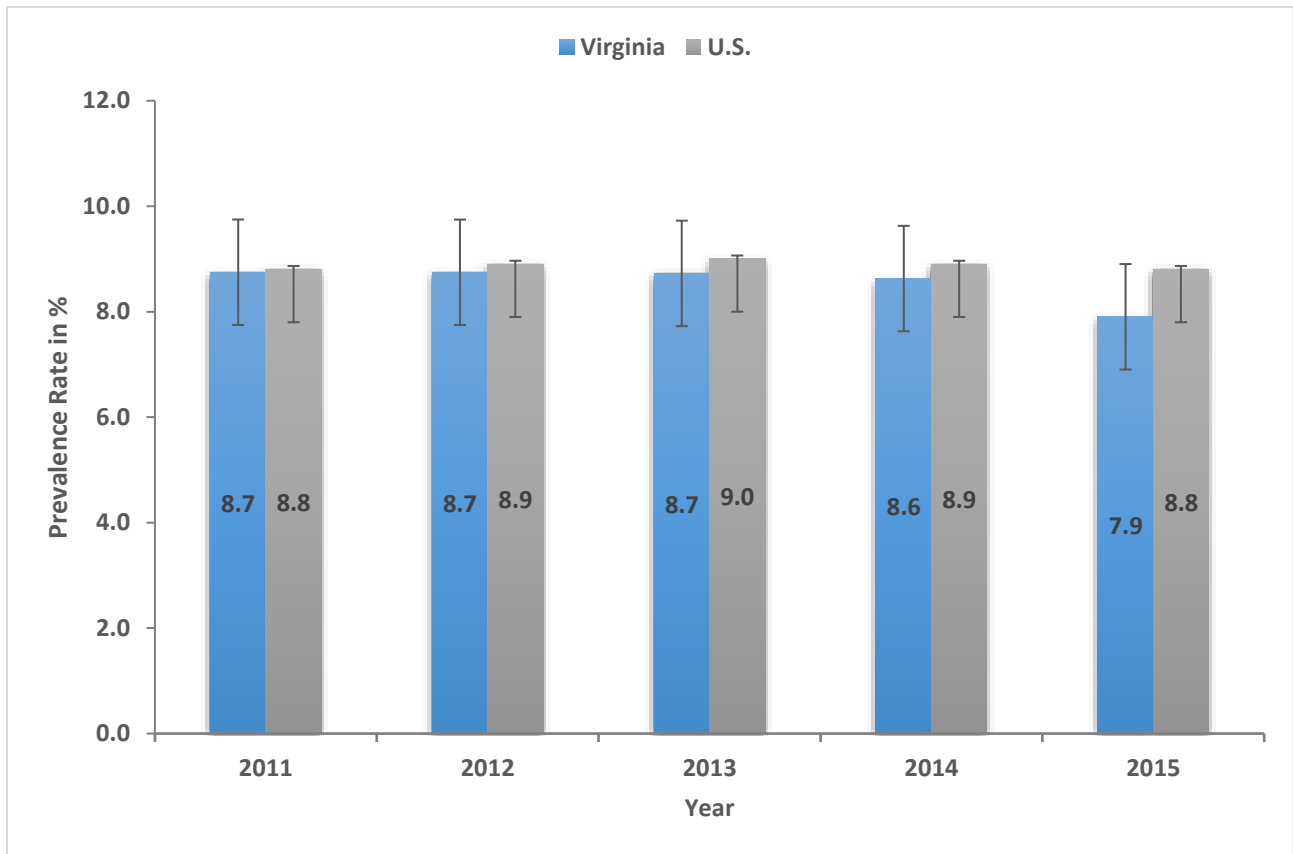
Adult Lifetime and Current Prevalence in Virginia: According to the 2016 Behavioral Risk Factor Surveillance System data, 560,419 Virginia adults reported having been told by a physician they had been diagnosed with asthma; this represented 6.7% of the total population and a 9.1% increase in the proportion of Virginians with asthma.

The 2016 lifetime asthma prevalence in Virginia was 13.3%. The 2016 current asthma prevalence in Virginia was 8.6%. For the period 2014-2016, the average lifetime asthma prevalence in adults, age 18 and over, was 12.8%, while the average current asthma prevalence was 7.5%.

Adult females both in the U.S. and Virginia had a higher lifetime and current prevalence of asthma compared to adult males. For the period 2014-2016, the three-year average lifetime asthma prevalence rate was 15.3% for adult females and 10.1% for adult males. The average current asthma prevalence rate for adult females was 11.0% and 5.5% for adult males.

¹The Centers for Disease Control and Prevention uses lifetime and current asthma prevalence to exam asthma rates. Lifetime asthma prevalence is the proportion of the population that has had asthma at some point in their lifetime. Current asthma prevalence is the proportion of the population who currently has asthma and reported so in the last 12-month period. Lifetime asthma for children is defined in terms of the number of children that have ever been diagnosed with asthma. Childhood current asthma is defined as the number of children who still had asthma.

Figure 1: Adult Self-Reported Current Asthma Prevalence Rate (Percent): Virginia and U.S., BRFSS, 2011 - 2015

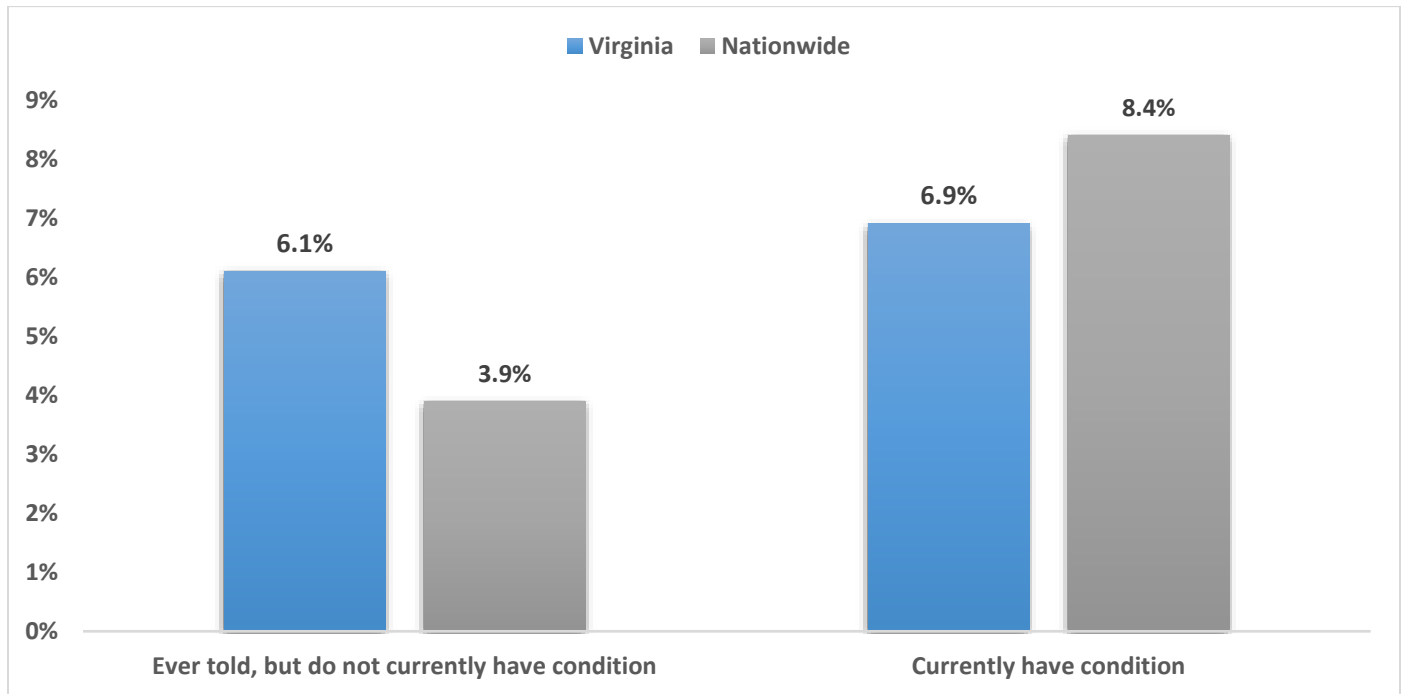


Source: Behavioral Risk Factor Surveillance System 2011-2015
 * — 95% confidence interval, weighted data.
 ** Asthma prevalence refers to percentage of adults that have asthma.

Children Lifetime and Current Prevalence in Virginia.

In addition to adults, a significant number of children also live with asthma. Across the U.S., an estimated 20.4 million adults aged 18 and over are known to have asthma, including 6.1 million children.¹ Although asthma is the leading chronic disease in children, according to the CDC, asthma episodes have declined in children from all races and ethnicities from 2001 through 2016. Overall, roughly 129,316 children living in Virginia currently have asthma.²

Figure 2: Children <17 Years of Age Prevalence of Asthma: Virginia, 2016



Source: National Survey of Children's Health, 2016

*Asthma as a primary diagnosis was calculated using ICD-10 diagnosis J45.

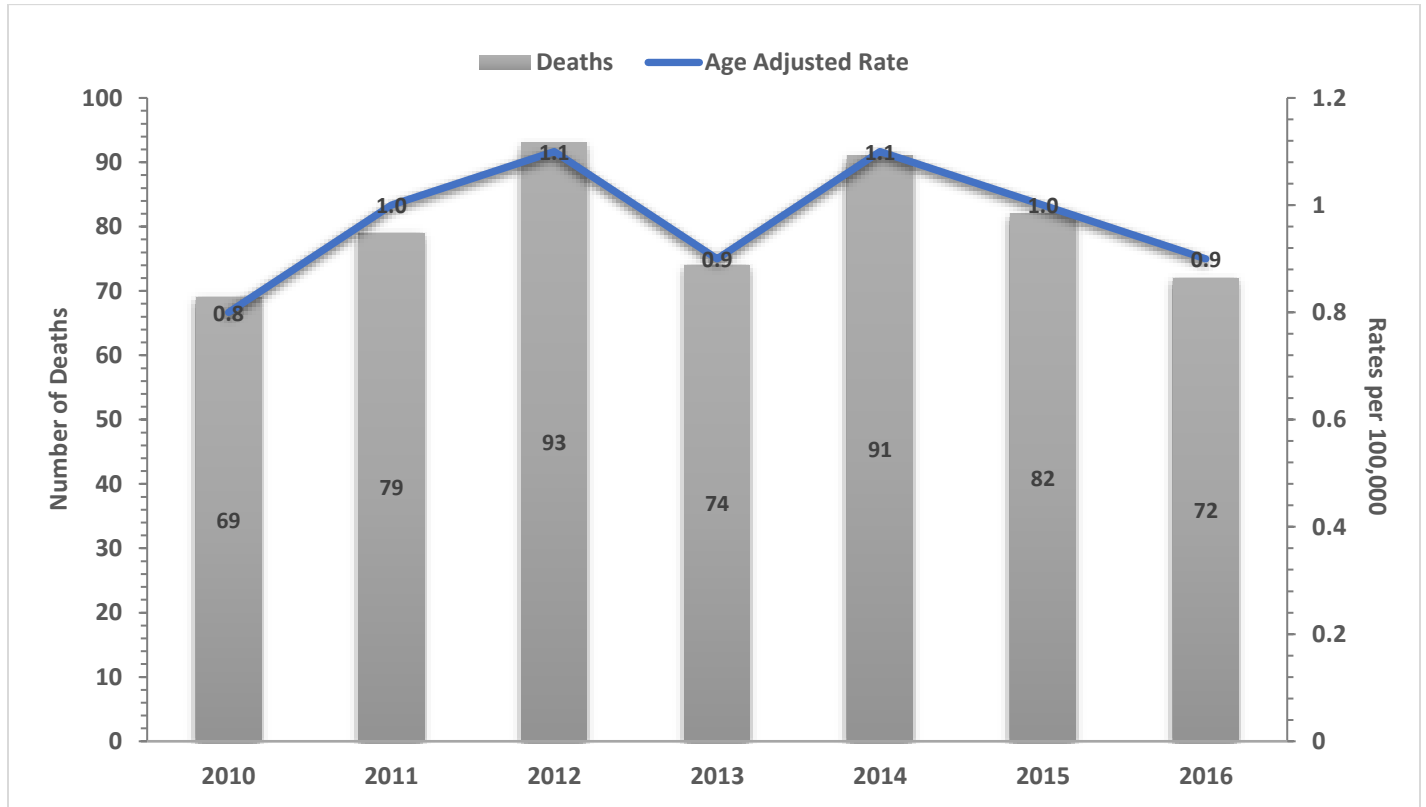
**Rates are age-adjusted to the 2000 standard population.

For the evaluation period of 2013, 2015 and 2017, the three-year average lifetime prevalence in high school aged children and middle school aged children was 22.3% and 19.6%, respectively. The lifetime prevalence was higher in boys compared to girls both in the U.S. and in Virginia. The three-year average lifetime asthma prevalence among middle school and high school aged boys was 21.7 percent; among girls, it was 20.1%.³

Asthma Trends: According to the 2016 Behavioral Risk Factor Surveillance System, there was a percentage decrease in the proportion of the population that currently have asthma (7.9%), between 2011 to 2016. However, the lifetime and current prevalence of asthma has been unchanged, ranging from 12.7 to 13.6% (lifetime) and 8.6 to 8.8% (current).

Mortality Trends and Rate: the 2016 asthma mortality rate in Virginia was 0.92 per 100,000 people, compared to U.S. rate of 1.0 per 100,000 people. This means about 1 in 100,000 people died from asthma in Virginia.

Figure 3: Asthma Counts and Age-Adjusted Death Rates by Year: Virginia, 2010-2016



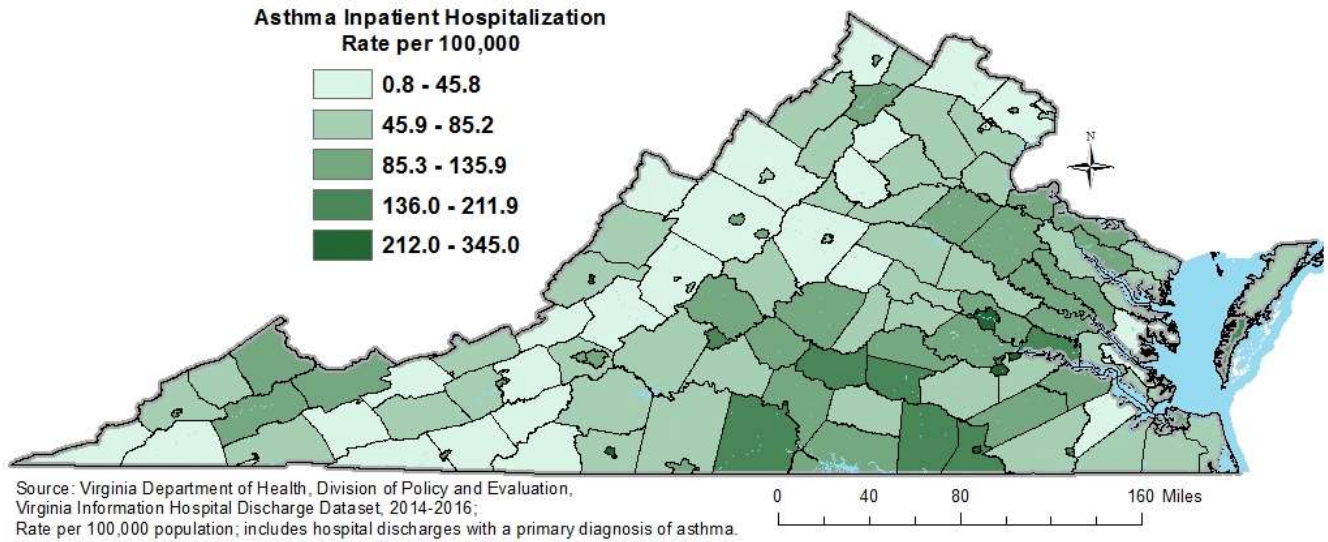
Source: CDC Wonder, 2018

*Asthma as a primary diagnosis was calculated using ICD-10 diagnosis J45.

**Rates are age-adjusted to the 2000 standard population

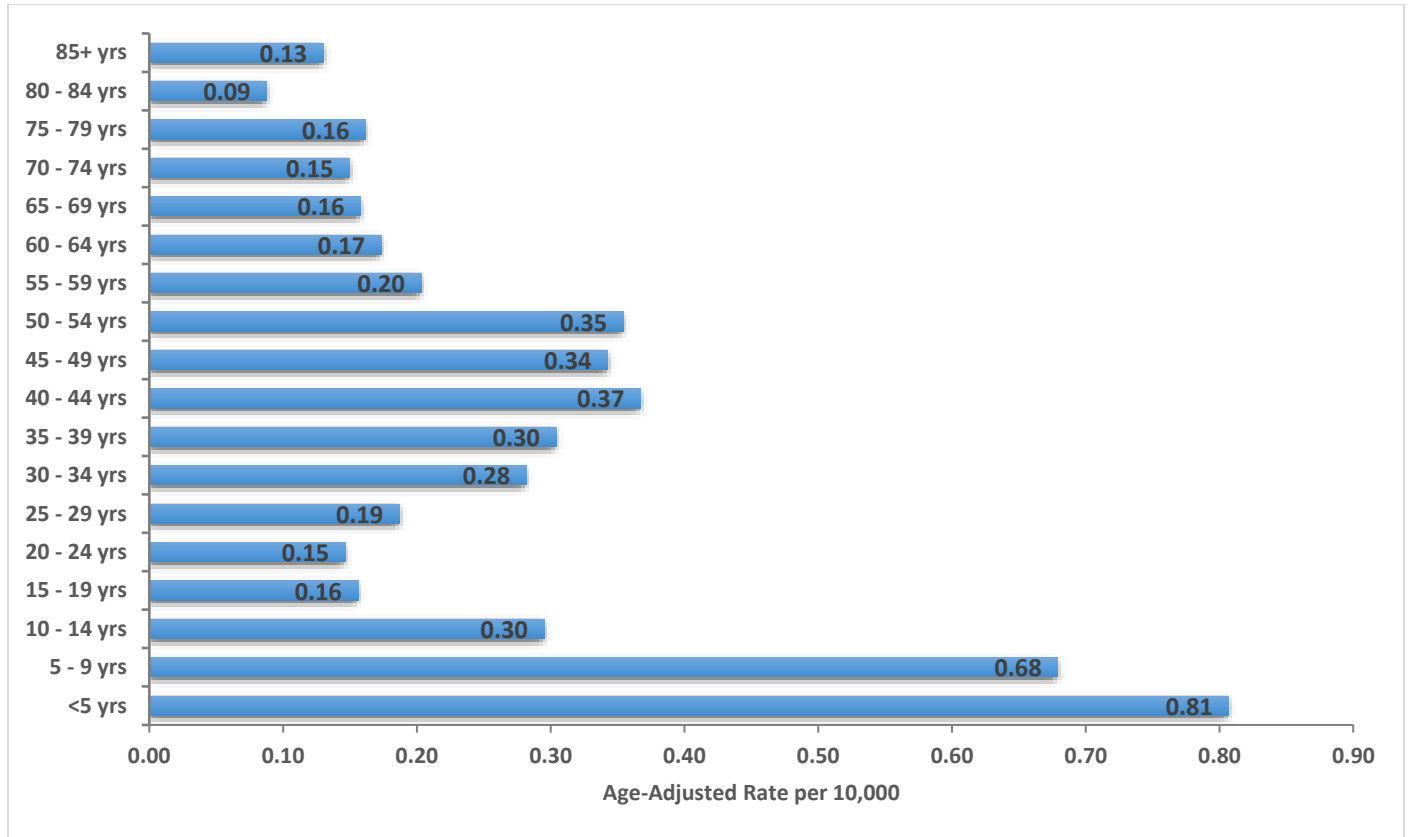
Asthma as an Economic/Public Issue: As one of this country’s most common and costly diseases, the annual economic cost of asthma from 2008 to 2013 was more than \$81.9 billion – including medical costs and loss of work and school days. Among children ages 5 to 17, asthma is one of the top causes of missed school days. In 2013, it accounted for more than 13.8 million missed school days.⁴

Figure 4: Age-Adjusted Asthma Hospitalization Rates by County/Cities: Virginia, 2014-2016.



Hospital Utilization Patterns: Since 2014, the number of asthma inpatient hospitalizations has been declining, from 7,582 to 4,120 or a 54.00% decrease. However, the number of individuals with asthma is on the rise. In 2016, there were 4,120 admissions of Virginia residents to hospitals where the primary diagnosis was asthma, with a crude hospitalization rate of 4.9 per 10,000. According to the 2015 Youth Risk Behavioral Survey, 19.2% (1,657) of students went to the emergency room or urgent care center because of their asthma (one or more times during the 12 months before the survey, among students who have asthma). Approximately 7.4% of Virginia's that currently have asthma are at risk of hospitalization. The map above depicts the age-adjusted rate for the 2014-2016 period by Virginia cities and counties. The lowest rate was 0.73 per 100,000, which occurred in Scott County in the Southwestern region of the state. The highest asthma hospitalization rate in this period (332.3 per 100,000) occurred in Petersburg City, in the Central Region of the Commonwealth. The annual age-adjusted rate of these discharges decreased across the period, from 2.9 per 100,000 to 2.5 per 100,000, with the lowest rate occurring in 2016 (1.6).

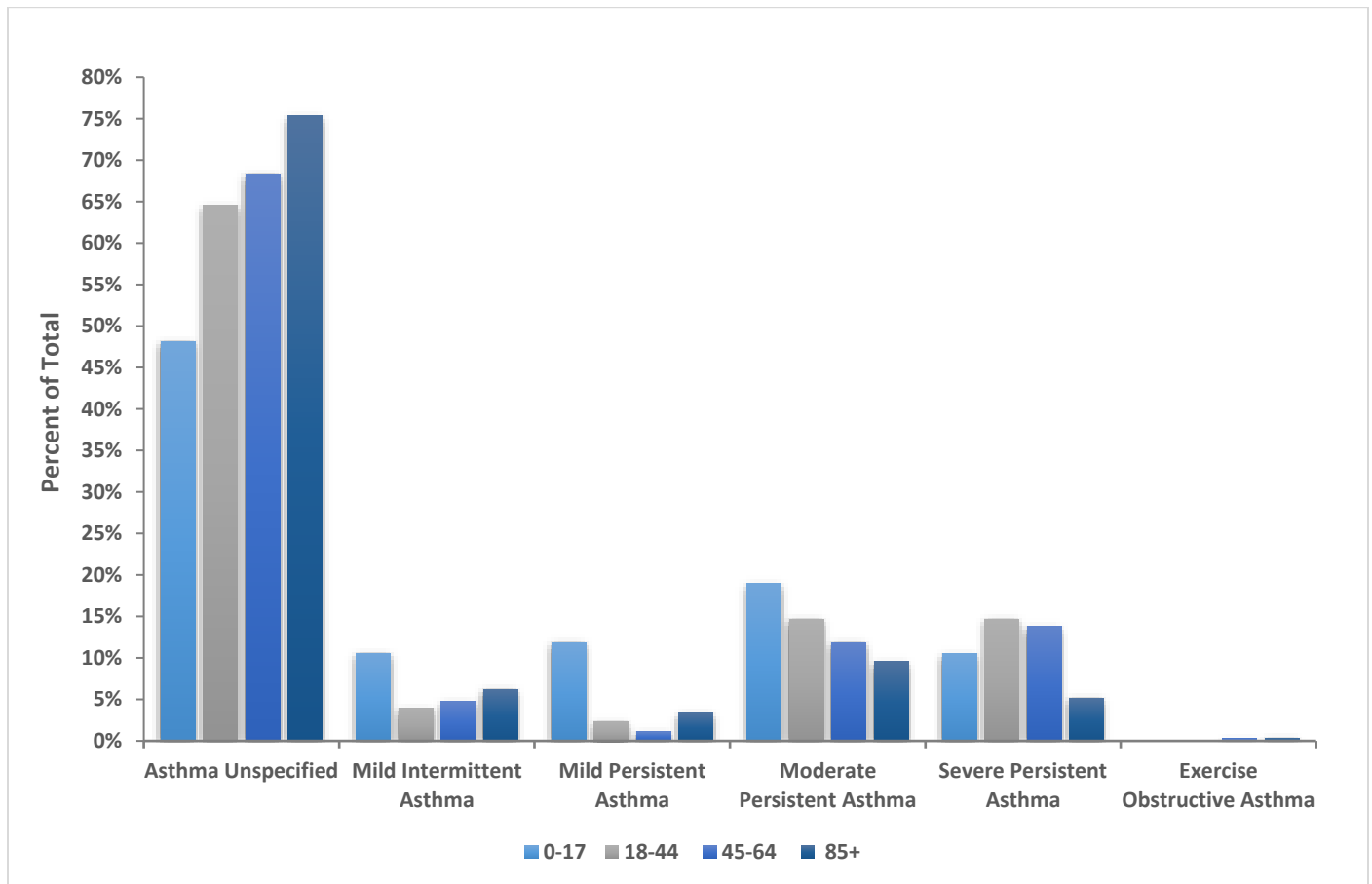
Figure 5: Age-Adjusted Asthma Hospitalization Rates by Age Group: Virginia, 2016.



Source: Virginia Health Information Hospital Discharge Dataset, 2016.
*Asthma as a primary diagnosis was calculated using ICD-10 diagnosis J45.
**Rates are age-adjusted to the 2000 standard population

The prevalence rate of asthma hospitalizations differs significantly by type and age group. Higher prevalence rates of hospitalizations may indicate the existence of poorly controlled asthma. In 2016, 75.4% of adults, 85 years plus, with unspecified types were more likely to be hospitalized for asthma exacerbation compared to children aged 0 to 17 years with moderate persistent asthma (18.9%).

Figure 6: Prevalence of Asthma Hospitalization among Asthma Types by Age Group: Virginia, 2016.



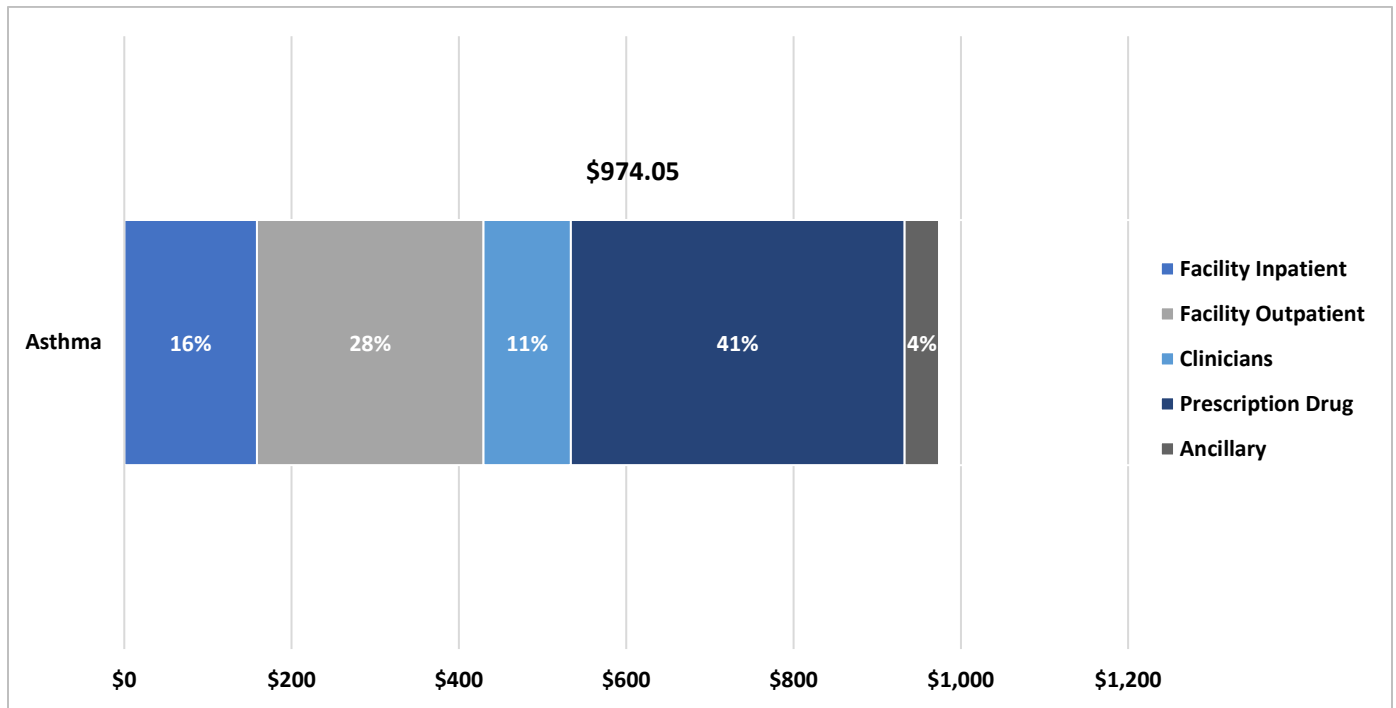
Source: Virginia Health Information Hospital Discharge Dataset, 2016.

*Asthma as a primary diagnosis was calculated using ICD-10 diagnosis J45.

**Asthma types with estimated percentages that are less than five percent, are not displayed on graph.

The total cost of asthma in terms of hospitalizations, indirect costs associated with clinicians (primary care physician and/or asthma specialist), facility inpatient and outpatient utilizations, prescription drug and ancillary costs is substantial. In 2016, approximately \$87,999,525.00 was charged for hospitalizations due to asthma. The average charge for inpatient hospitalizations was \$21,359, and the average total annual cost per individual for asthma treatment was \$974.05. Approximately 41% (\$399.06) of the average annual cost was due to pharmaceutical drugs.

Figure 7: Average Total Annual Cost per Individual for Asthma Treatment by Major Cost Category: Virginia, 2016.

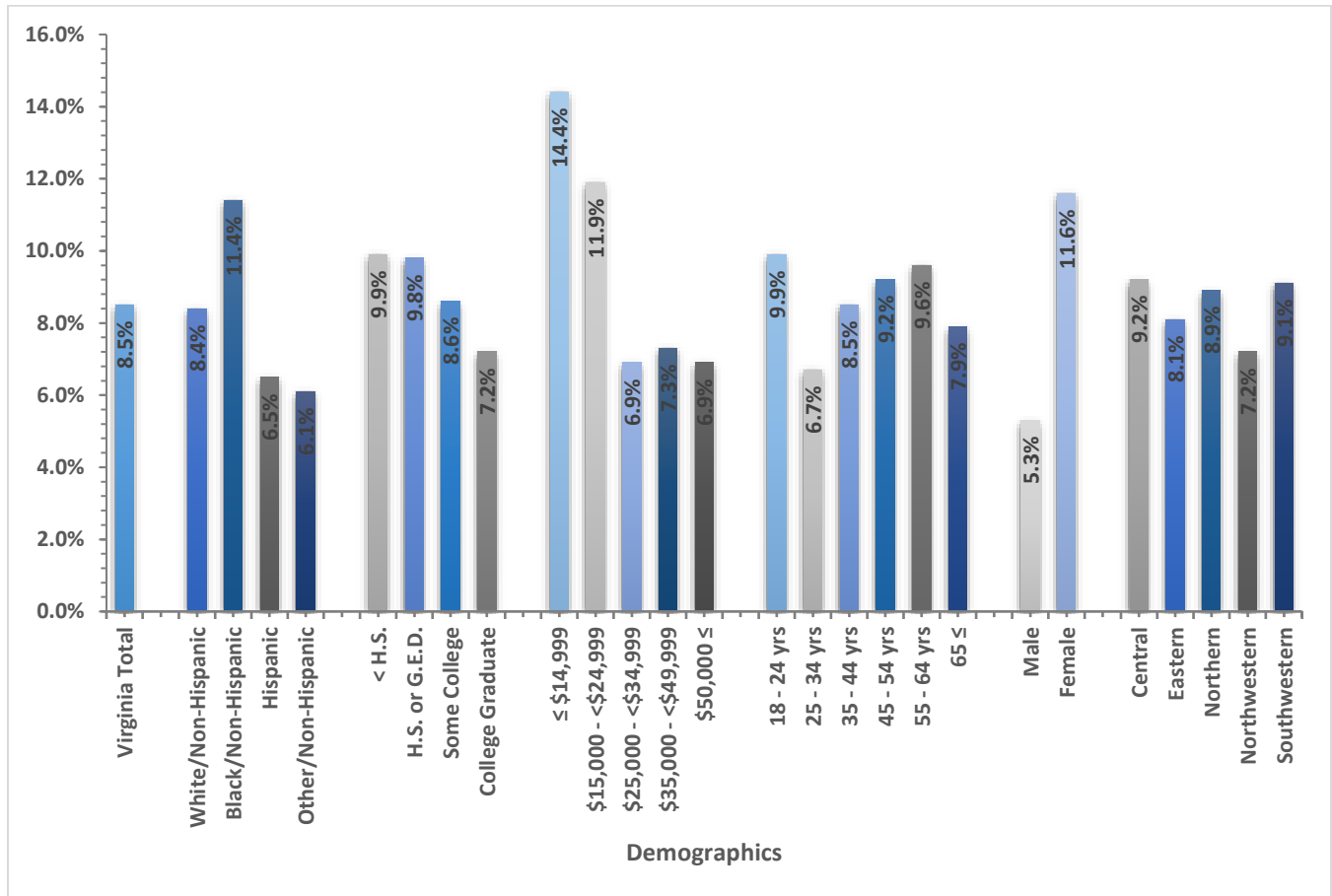


Source: Virginia All Payers Claim Database, 2016.
 *Asthma as a primary diagnosis was calculated using ICD-10 diagnosis J45.

Socio-Demographics of Asthma in Virginia:

Research has shown significant racial/ ethnic and income disparities in asthma rates, with populations of color and people in poverty experiencing consistently higher asthma prevalence rates and poor asthma outcomes compared with the general population. For this reason, asthma is a particularly important health equity indicator. According to the 2016 Behavioral Risk Factor Surveillance System survey:

Figure 8: Percentage Distribution of Demographics for Adult Current Asthma Cases by Race/Ethnicity, Education, Income, Age Group, Sex, and Region: Virginia, Behavioral Risk Factor Surveillance System, 2016



Source: Virginia Department of Health, Division of Population Health Data, Behavioral Risk Factor Surveillance Survey, 2011-2016. Weighted counts and weighted percent's are weighted to population characteristics. Responses of don't know/not sure, refused, or missing were removed from the numerator and denominator in all estimates.

Adults

- **Sex:** Current asthma prevalence was higher among females (11.6%) compared to males (5.3%).
- **Age:** Current asthma prevalence was higher among adults aged 18–24 years (9.9%) compared with adults aged 25-34 years (6.7%), 35-44 years (8.5%), 45–54 years (9.2%), 55-64 years (9.6%), and 65 years and older (7.9%).
- **Race/Ethnicity:** When compared with white adults (8.4%), black adults (11.4%) had a higher current asthma prevalence. Also, adult black non-Hispanics had a higher three-year average lifetime asthma prevalence compared to adult white non-Hispanics (15.7 versus 12.5 percent). Hispanics made up about 18.5 percent of those with current asthma between 2014 and 2016.
- **Household Income:** Current asthma was more prevalent among adults who lived in households with an income less than \$15,000 (14.4%), \$15,000 to less than \$25,000 (11.9%), \$25,000 to less than \$50,000 (6.9%), and \$50,000 to less than \$75,000 (7.3%) compared with adults who lived in households with an income of \$75,000 or more (6.9%).

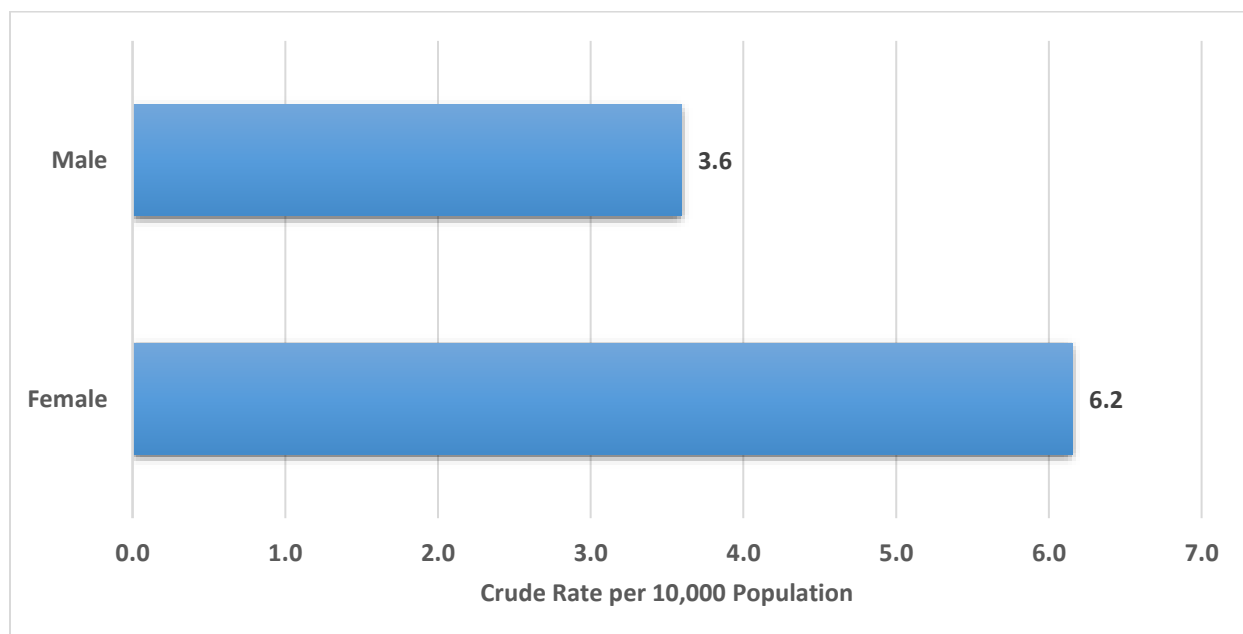
- **Adult Education:** Current asthma prevalence was higher among adults who did not graduate from high school (9.9%) compared with high school (9.8%) or college graduates (7.2%).
- **Region:** The Commonwealth of Virginia has five regions, namely northwestern, north, southwestern, central and east. In 2017, children residing in the Central region of Virginia had a lifetime asthma prevalence of 23.3 percent. In 2016, adults residing in the Central region of Virginia had the highest current asthma prevalence at 9.2 percent. The poorest health districts in Virginia are Crater and Southside, which are traditionally tobacco-growing areas, with low rates of health insurance districts. Their two-year average current adult asthma prevalence rates were 9.1 and 13.8 percent, respectively. These rates were higher than the Virginia average of 8.25 percent.¹

Children

- **Age:** Current asthma prevalence was lower among children aged 0–5 years (3.3%) compared with children aged 6-11 years (8.3%), 10–14 years (9.4%), and 12-17 years (9.2%).⁵
- **Sex:** Current asthma prevalence was higher among females (7.1%) compared with males (6.8%).⁵
- **Race and Ethnicity:** Current asthma prevalence was higher among Black, NH (11.3%), Hispanic (7.4%), Other, NH (7.2%), White, NH (5.9%) children compared with Asian children (2.1%).⁵

Morbidity-Virginia Hospitalization Rates: Hospitalization measures may be used to assess morbidity and asthma control. Healthcare utilization differs significantly by gender, age, race, and by ethnicity. Based on the 2016 estimates, approximately 4,120 patients were hospitalized for asthma.

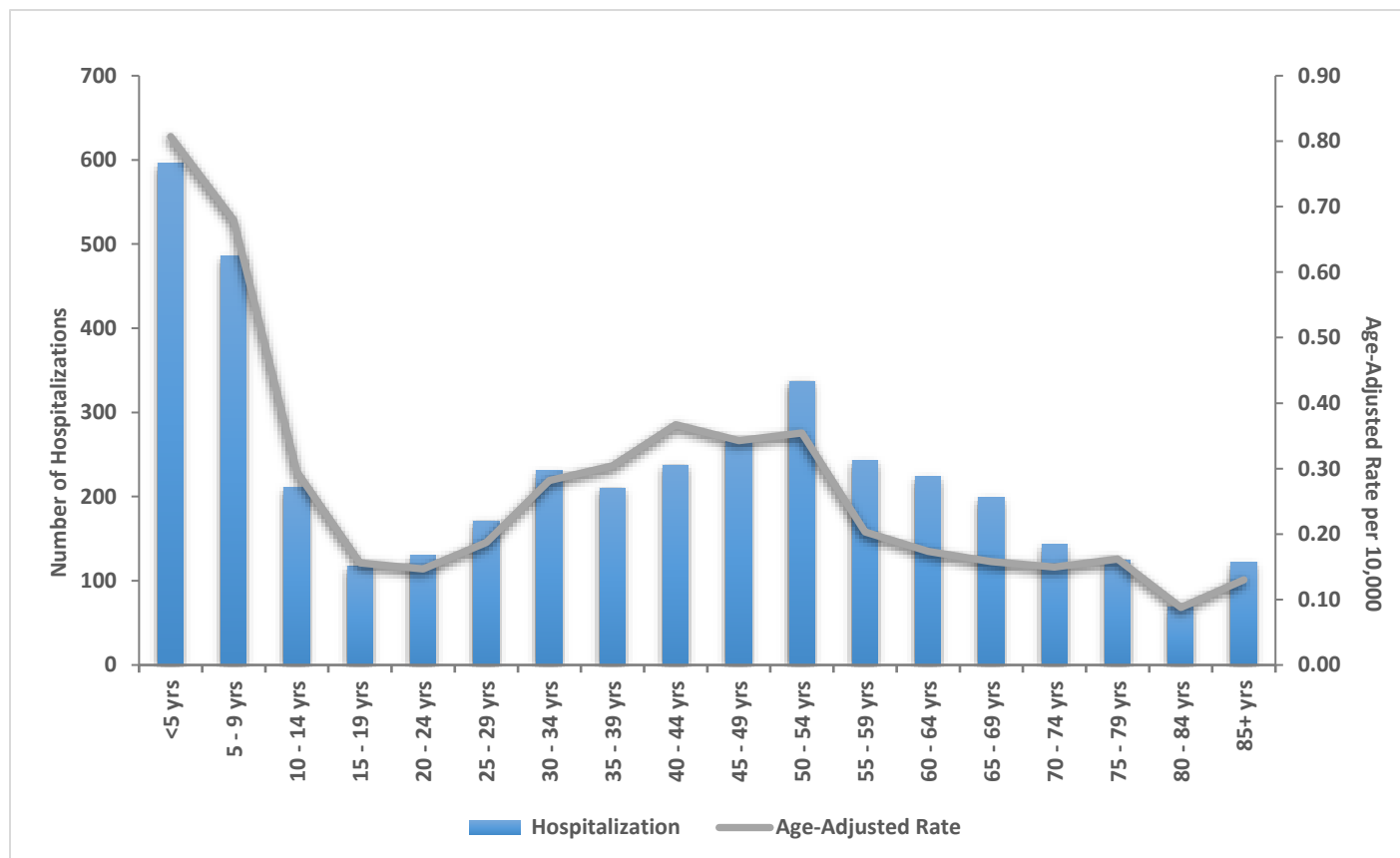
Figure 9: Asthma Hospitalization Rates by Gender: Virginia, 2016



Source: Virginia Health Information Hospital Discharge Dataset, 2016.
 *Asthma as a primary diagnosis was calculated using ICD-10 diagnosis J45.
 **Rates are crude rates per 10,000 population.

- **Gender:** Asthma hospitalization rates were higher for female patients than for males, reflecting a higher prevalence of asthma in females.

Figure 10: Asthma Hospitalization Rates by Age Group: Virginia, 2016

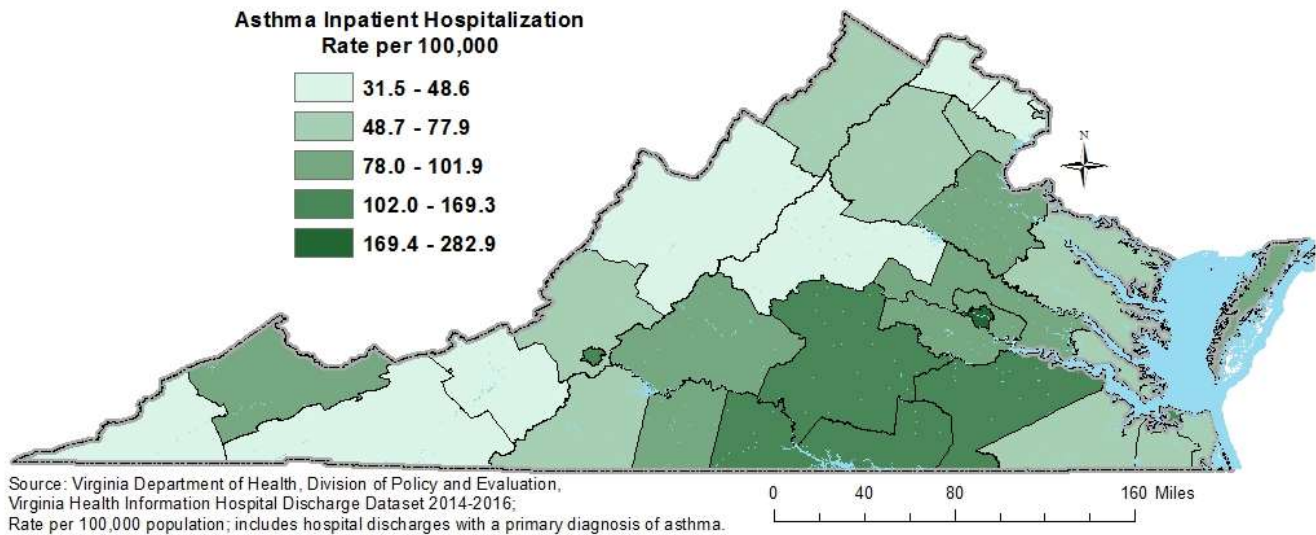


Source: Virginia Health Information Hospital Discharge Dataset, 2016.
 *Asthma as a primary diagnosis was calculated using ICD-10 diagnosis J45.
 **Rates are age-adjusted to the 2000 standard population

- **Age Group:** Hospitalizations discharge rates was highest among children aged 5-14 years (1.17), followed by adults aged 45-54 years (0.9), and adults 35-44 years (0.8) per 10,000 of the population.
- **Race/Ethnicity:** Race and ethnicity make a difference: Blacks were nearly 4.3 times more likely to be hospitalized for asthma than Whites. Whites (40.5%) and Blacks (49.3%) were more likely than any other race/ethnicity to be hospitalized for asthma, compared to Hispanics (2.6%), and Asians (2.0%) and Others (5.4%).

Health Districts and Prevalence Rate of Asthma in Virginia:

Figure 11: Age-Adjusted Asthma Inpatient Hospitalization Rates by Local Health Districts: Virginia, 2014 - 2016



In the map above, the age-adjusted asthma hospitalization rate per 100,000 persons is displayed by VDH Local Health Districts for the period of 2014-2016. As depicted, rates were highest in the Richmond City (279.4 per 100,000), Crater (163.9 per 100,000) and the Southside Health District (143.6 per 100,000) and lowest in the Arlington Health District (30.4 per 100,000).

Mortality from Asthma: Deaths and underlying causes of deaths due to asthma are uncommon and are mostly preventable, with a majority of deaths occurring in persons aged 65 years and older. Asthma deaths have decreased over time and varied by demographic characteristics. From 2014 to 2016, females had a higher death rate than males, (1.2 versus 0.7 per 100,000). The state-wide rate of asthma as an underlying cause of death decreased from 1.5 per 100,000 in 2000 (n=108) to 0.9 per 100,000 (n=72) in 2016.⁶

Definitions

- **Asthma:** a chronic, long term lung disease that inflames and narrows the airways, resulting in wheezing, chest tightness, shortness of breath, and coughing; attacks or episodes are most frequent at night or early in the morning; both adults and children can develop asthma.
- **Asthma attack (flare-up or exacerbation):** sudden onset of asthma symptoms; when the airways react, the muscles around them tighten, narrowing the airway and often producing mucus, which further narrows the airways.
- **Intrinsic (non-allergic) asthma:** a chronic, inflammatory disorder of the airways characterized by wheezing, breathing difficulties, coughing, chest tightness caused by inhalation of an irritant but not caused by an allergic reaction; non-allergic asthma is triggered by other factors such as anxiety, stress, exercise, cold air, dry air, hyperventilation, smoke, viruses or other irritants. In non-allergic asthma, the immune system is not involved in the reaction.
- **Extrinsic (allergic) asthma:** a chronic, inflammatory disorder of the airways characterized by wheezing, breathing difficulties, coughing, chest tightness, caused by an allergic reaction to an

inhaled allergen from the environment; this is the most common type of asthma, caused by external materials which cause a response from the immune system in the form of an allergic reaction.

- **Spirometry:** a test for diagnosing asthma which evaluates lung function by measuring the maximum volume that can be exhaled after breathing in the maximum amount of air; measures the strength of the lungs related to the narrowing of airways caused by asthma.

Risk Factors and Triggers of Asthma:

According to the World Health Organization, the strongest risk factors for developing asthma are a combination of genetic predisposition and environmental exposure to inhaled substances and particles such as air pollution and chemical irritants. Several examples of environmental behavioral and genetic genomic risk factors and triggers are described below:

- **Environmental Risk Factors and Triggers:** Triggers of asthma and asthma attacks include pollen, animal dander, mold, cockroaches, dust mites, tobacco smoke, smoke from burning wood or grass, industrial fumes, bad weather (thunderstorms, high humidity).
- **Behavioral Risk factors and Triggers:** smoking, physical exercise, some medicines; certain foods, allergic reactions, breathing in cold, dry air; infections linked to influenza (flu), colds, respiratory syncytial virus (RSV), and stress or strong emotions can lead to hyperventilation also triggering an asthma attack.
- **Inherent Risk Factors and Triggers:** family history of allergies, hay fever or eczema may predispose an individual towards asthma; in addition certain genders, age groups, racial groups and ethnicities have higher asthma incidence; education and income levels are risk factors, as well as medical conditions such as respiratory infections and use of certain medications.

Patterns of Asthma Attacks, Symptom and Symptom Types, and Diagnosis of Asthma

- **Symptom Types:** Asthma is a chronic lung disease of the airways which is characterized by two sets of symptoms:
 1. The bronchi (the airway branches leading to the lungs) become overly reactive and sensitive to all kinds of triggers including allergens, cold air, dry air, smoke, viruses and other triggers;
 2. The lungs are unable to move air in and out, due to airflow obstruction;
 - a. The combined effect results in coughing, wheezing, tight chest and other symptoms and conditions.
- **Pattern of Asthma:** Asthma is characterized by symptom-free periods with periodic attacks, although many people with asthma have some wheezing, shortness of breath and coughing at all times.
- **Symptoms:** The symptoms of asthma include:
 - Cough with or without sputum (phlegm) production
 - Intercostal retractions – pulling in of the skin between the ribs when breathing
 - Shortness of breath that worsens with activity
 - Wheezing which often starts suddenly, may be episodic, increasing in the morning or evening, improves with bronchodilators and worsens when breathing cold air and with exercise.

- **Emergency Symptoms:** GO TO AN EMERGENCY ROOM if any of these symptoms occur: bluish color (face and lips, indicating insufficient oxygen), drowsiness or confusion, extreme difficulty breathing, rapid pulse, severe anxiety due to insufficient air; in addition an attack may be characterized by abnormal, uneven breathing pattern, cessation of breathing, chest pain or tightness in the chest.
- **Diagnosis of Asthma:** a full battery of tests may be used to diagnose asthma and to differentiate it from other conditions; these include:
 - Evaluation of lung sounds using a stethoscope (wheezing, other lung sounds)
 - Allergy testing to identify allergens
 - Arterial blood gas test to determine levels of blood oxygen
 - Chest x-ray
 - Lung function tests
 - Peak flow measurements to measure the ability of the lungs to expel air
 - Blood tests to measure eosinophil (white blood cell) and IgE (immunoglobulin) levels as identifiers of immune response to allergens.

Asthma Management

Although there is no cure for asthma, prevention of symptoms is the best strategy. Asthmatics should know what circumstances trigger an attack and avoid them whenever possible. If asthma attacks are severe, are unpredictable or flare up more than twice a week, consultation with a doctor can help to determine their cause and provide long-term treatment that controls the symptoms. Key elements to prevent asthma should include:

- Use of “allergy-proof” casings for bedding
- Minimize use of carpets and rugs, and vacuum frequently
- Use only unscented cleaning materials
- Keep humidity low and reduce growth of organisms such as mold
- Reduce spread of cockroaches and other insects by keeping food in limited space, in kitchen
- Eliminate tobacco smoke from the home, including smoking of others, and even clothing with embedded smoke
- Avoid air pollution, industrial dust and fumes

Treatment of Asthma- Treatment Plan and Medication:

Effective asthma treatment includes monitoring the disease with a peak flow meter, identifying and avoiding allergen triggers, using drug therapies including bronchodilators and anti-inflammatory agents, and developing an emergency plan for severe attacks. The intent of asthma treatment is to reduce exposure to triggers and to control the swelling of the airways; treatment should always include the development of a written plan to eliminate the triggers, to monitor symptoms and to manage asthma attacks when they occur; medications may be used, and have two main functions:

- **Control drugs:** to prevent asthma attacks; these include beta-agonist inhalers to prevent symptoms and are often taken long term along with inhaled steroid medication.
- **Rescue drugs:** to provide rapid relief and to reduce the symptoms of an attack; these are taken at the time of an asthma attack to quickly reduce symptoms (when coughing, wheezing or having trouble breathing); can also be taken prior to exercise to prevent exercise-induced symptoms; these include bronchodilators or oral steroids.

- **Other medications:** additional medical care may be needed for severe asthma attacks that cannot be controlled with rescue drugs and may include intravenous medications, oxygen, breathing assistance and other treatments.

Complications of Asthma: Many people with asthma find that symptoms improve over time with reduced frequency of asthma attacks. However, there are potentially serious complications that may develop:

- Decreased ability to carry out activities of daily living including exercise
- Impact on sleep due to attacks at night time
- Long term reduction in lung function
- Persistent cough
- Difficulty breathing, requiring use of a ventilator
- Death

Reference

1. Virginia Department of Health, Division of Health Population Data Behavioral Risk Factor Surveillance System, 2011 – 2017. Retrieved from <http://www.vdh.virginia.gov/livewell/data/surveys/brfss>
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