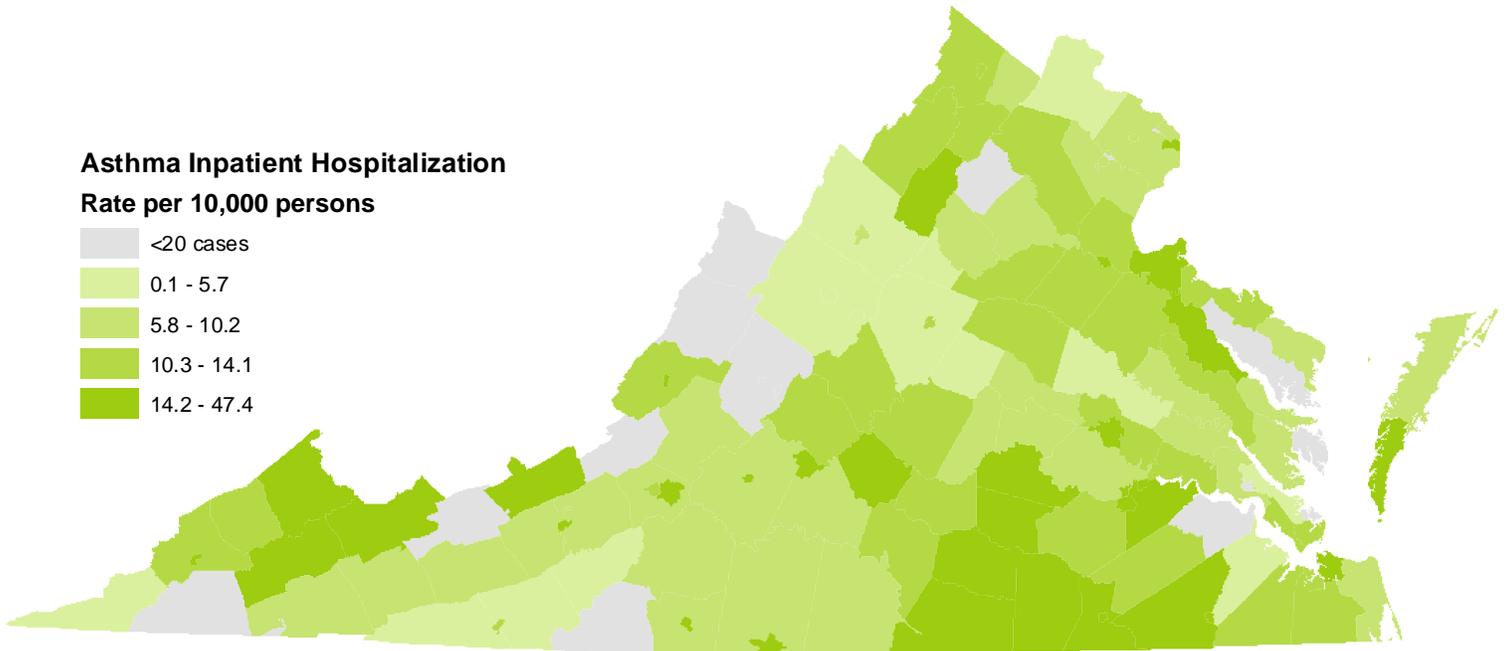
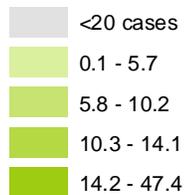


Asthma Burden in Virginia

Asthma is a long term chronic lung disease affecting people of all ages, often starts in childhood, and causes swelling of the airways resulting in trouble breathing. Asthma is not curable but it is a manageable condition and often decreases in severity over time. While potentially life-threatening, normal activities are usually possible with good medical care. However, the cost of medication is an obstacle to optimal asthma care, particularly for disadvantaged populations.

Asthma Inpatient Hospitalization Rate per 10,000 persons

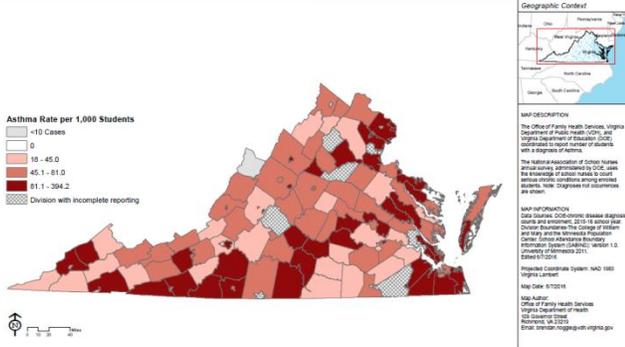


Source: Virginia Health Information Hospital Discharge Dataset, 2011-2012-2013. Asthma as a primary diagnosis was calculated using ICD-9 diagnosis code 493. Rates are age-adjusted based on 2000 U.S. standard population.

South-Central Virginia has the highest inpatient hospitalization rates in Virginia. Several of Virginia's major cities also show high hospitalization rates including Richmond and Roanoke.

Adult Lifetime and Current Prevalence in Virginia and the U.S. In 2014, 821,089 adults in Virginia reported having been told by a physician at one time over the course of their lives that they had been diagnosed with asthma; this represents 12.7% of the total population and matches the median U.S value (BRFSS, 2014).

Child Lifetime & Current Prevalence in Virginia and the U.S. A higher percentage of high school students, 22.4%, had ever been told by a doctor or nurse that they had asthma (VYS, 2014). Fewer individuals have current asthma. In Virginia, 8.7% of adults (BRFSS, 2014) and 9% of children aged 0-17 years currently have asthma (NSCH, 2011-2012). This is slightly more than the U.S median of 8.6% (BRFSS, 2014) and 8.8% of children 0-17 (NSCH, 2011-2012). The map below provides valuable information in understanding the distribution of asthma prevalence among children in Virginia and to determine how differences in asthma landscape actually affect health at the school district level.



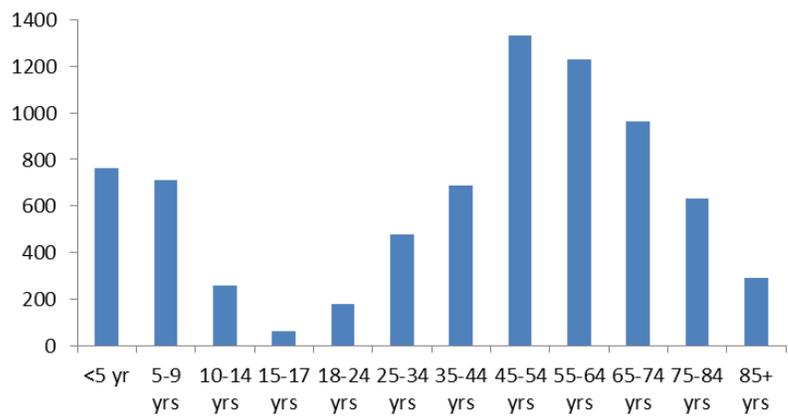
Southwest and Southside Virginia are predominantly rural areas and are the traditional mining regions of the State. It has been known for the past two and half decades as the most medically underserved areas of the Commonwealth. These regions have the highest rates of those below 200% FPL. With the large spread between 100% and 200% FPL; it is noteworthy that lack of health insurance has both important health and financial consequences. Health disparities across socioeconomic groups

have existed for many years but have recently received increasing attention from researchers, policy makers and the general public. National data (CDC) suggests that children between the ages of 5-11 years have high asthma prevalence than the national average (10.6% vs 7.7%). However, African-American children under the ages of 18years (13.4%) have almost twice the prevalence rate compared to White children in the same age category (7.6%). For example, according to CDC, in 2014, the asthma rate for persons living below 100% Federal Poverty Line (10.4 %) was higher than any other poverty group.

Asthma as an Economic Issue The cost of asthma for the U.S. was \$56 billion in 2009; the cost per year per child with asthma was over \$1,000. In 2008, there were 10.5 million missed days of school and 14.2 missed days of work across the U.S. due to asthma (CDC Asthma Impact, 2013). CDC estimates that in 2010 the medical and absenteeism costs in Virginia totaled 808 million dollars and estimates that in 2016 these total costs will be over 1.1 billion dollars yearly (CDC Cost Calculator). **Asthma Trends Between 2011 and 2014**, the lifetime and current prevalence of asthma has been unchanged, ranging between 12.7 to 13.6% (lifetime) and 8.6 to 8.8% (current).

Healthcare Utilization Patterns In the U.S., asthma as primary diagnosis accounted for 10.5 million visits to physician offices (NAMCS, 2012). In 2014, there were 7,582 admissions of Virginia residents to Virginia hospitals where the primary diagnosis was asthma; the total charges for these cases was over \$156 million or an average of \$20,600 per case; there is a marked difference among age groups for inpatient hospitalization, where there are two peaks; children aged under 5 had the greatest number of discharges among youth, with a second rise in case volume peaking at the 45-54 age group.

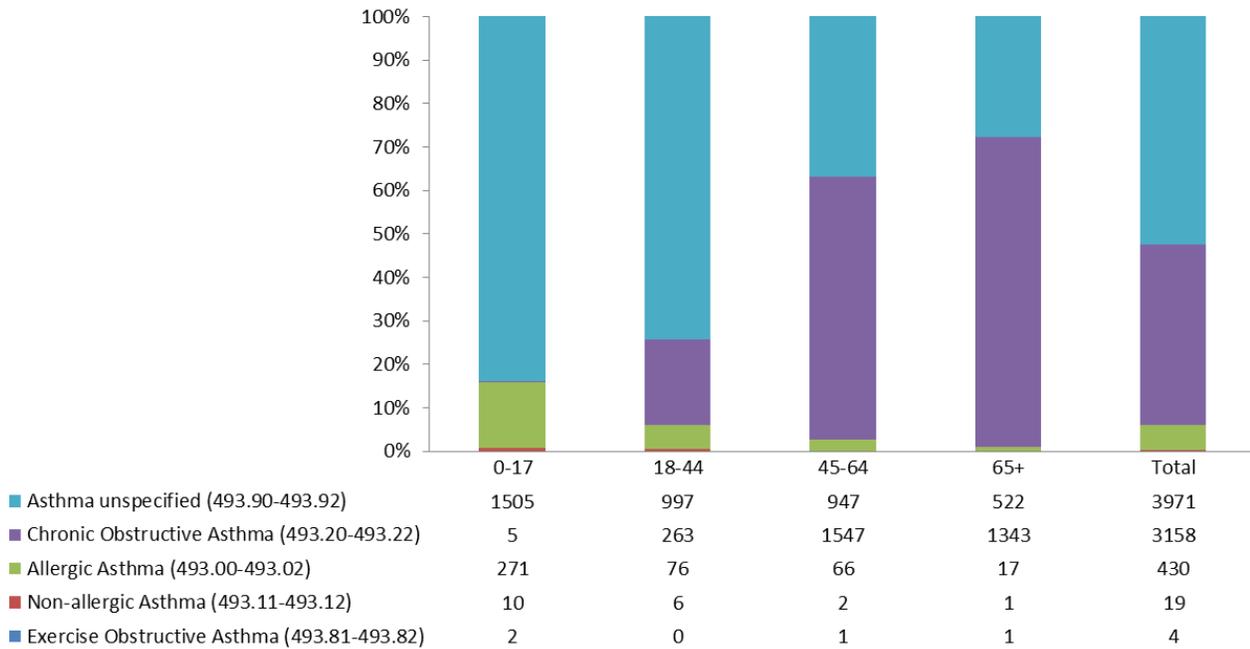
Number of Asthma Hospitalizations, Virginia, 2014



Source: Virginia Health Information Hospital Discharge Dataset, 2014. Asthma as a primary diagnosis was calculated using ICD-9 diagnosis code 493.

Hospitalization patterns differed among the basic categories of asthma and age groups, with chronic obstructive asthma affecting the older populations and unspecified asthma types affecting children under age 17.

Asthma Hospitalizations by Type, 2014

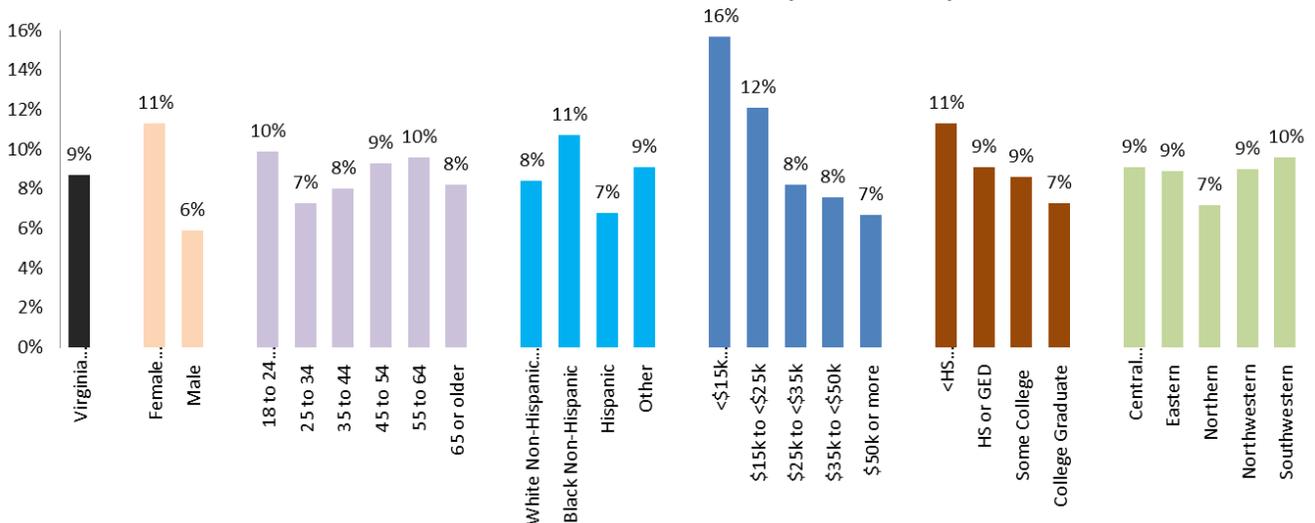


Source: Virginia Health Information Hospital Discharge Dataset, 2014. Asthma as a primary diagnosis was calculated using ICD-9 diagnosis codes 493.

Socio-Demographics of Current Asthma in Virginia

Asthma affects women significantly more than it affects men, almost double the percent. The distribution of asthma by age is bimodal, with a peak in the youngest group and another peak in middle age (55-64). Black, non-Hispanic populations have the highest percent of current asthma, and Hispanics have the lowest. Current asthma decreases with increased income and education. Northern Virginia has lower prevalence compared with other regions.

Adult Current Asthma Prevalence, VA BRFSS, 2014

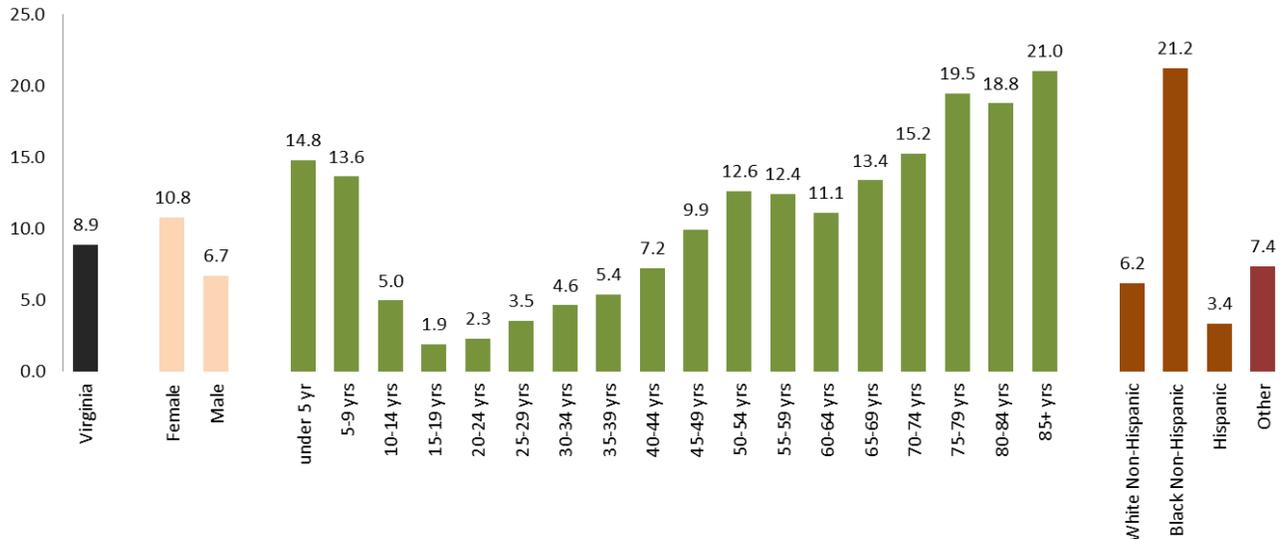


Source: Virginia Behavioral Risk Factor Surveillance System, 2014. Percents are weighted based on demographic and household characteristics.

Morbidity - Virginia Hospitalization Rates

Hospitalization rates among females are over 50% higher, reflecting the higher prevalence among women. Hospitalization rates by age have two peaks, one in the under 1 year and 1 - 4 year age group, and a second peak starting in the 45-54 age group and increasing steadily across all remaining age groups. Non-Hispanic Blacks have a higher hospitalization rate compared to any other race.

Hospitalizations in Virginia per 10,000 Persons, 2014



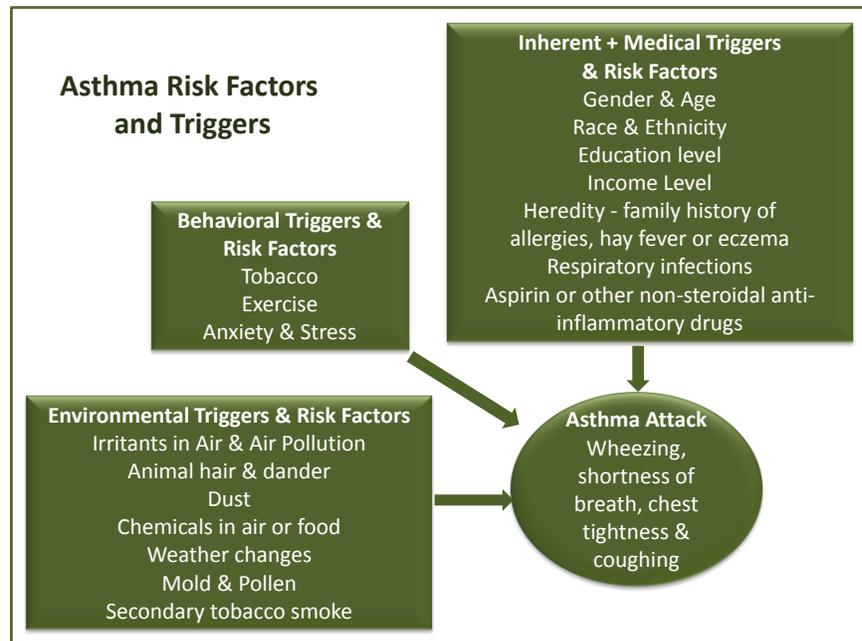
Source: Virginia Health Information Hospital Discharge Dataset, 2014. Asthma as a primary diagnosis was calculated using ICD-9 diagnosis codes 493. Rates are age-adjusted based on 2000 U.S. standard population and are per 10,000 populations.

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 mucus often is produced, 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

- **Environmental risk factors & triggers:** both intrinsic (non-allergic) and extrinsic (allergic) asthma may be triggered by materials in the environment which may either cause irritation or an allergic reaction, resulting in an asthma attack; these include particulates such as dust, mold, pollen, smoke or animal hair and dander; alternatively, chemicals in the air may trigger attacks and may include air pollution, perfume and other chemicals; finally, changes in temperature can trigger asthma attacks.



- **Behavioral risk factors and triggers:** smoking, exercise and heightened anxiety and stress may trigger asthma attacks.
- **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.

Description, Symptoms, Warning Signs and Diagnosis of Asthma

- **Symptom Types:** Asthma is a chronic inflammatory 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;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

Treatment of Asthma - Treatment Plan and Medication:

A combined approach using treatment planning and use of medication is necessary for the control of asthma symptoms. 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.

Impact of Asthma on Health: while there is no cure for asthma, proper medical care and self-management can reduce the frequency and seriousness of asthma attacks. Key elements to prevention of asthma attacks involve avoidance of triggers:

- 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

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

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