

THE BURDEN OF ASTHMA IN RHODE ISLAND 2014



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INTRODUCTION

Asthma is a chronic respiratory disease that causes a person's airways to narrow, resulting in difficulty breathing, including wheezing, shortness of breath, chest tightness, and coughing. If left untreated, asthma can cause permanent lung damage, disability, and even death. An asthma attack occurs when a person with asthma has greater difficulty breathing than their normal level and requires increased medication. Asthma attacks are also known as asthma flare-ups, asthma episodes, or asthma exacerbations.

There is no cure for asthma, but the condition can usually be managed and attacks can be prevented. Asthma is treated in two ways: by avoiding potential triggers and with medication. Asthma medications fall into two categories: 1) rescue medications and 2) controller medications. Rescue medications treat asthma exacerbations (e.g., decline in lung function and/or increase in asthma symptoms). They are also known as "reliever," "quick-relief," or "fast-acting" medications. Controller medications manage asthma and prevent symptoms from occurring from the outset. Controller medications (also called "preventive" or "maintenance" medications) treat the problem of airway inflammation instead of the symptoms (coughing, wheezing, etc.) that it causes. Controller medications are slow acting and can take days or even weeks to begin working. These medications minimize any permanent lung changes that may be associated with having asthma.

The Rhode Island Department of Health Asthma Control Program has established an asthma surveillance system to better understand and describe the burden of asthma in Rhode Island. Data tracking various aspects of asthma—asthma prevalence, visits to the hospital and the emergency department (ED), claims data, and mortality—were critical to the completion of the goals and objectives in the Asthma State Plan, and for planning policy and programmatic interventions to reduce the burden of asthma in the Rhode Island population. The purpose of this report is to describe the prevalence of asthma and asthma-related health outcomes in Rhode Island using the most recent data available. The Burden of Asthma in Rhode Island, 2014 is an updated version of three earlier publications on the burden of asthma in Rhode Island, published in 2004, 2007, and 2009.

Data for this report come from the Rhode Island Behavioral Risk Factor Surveillance System (BRFSS), the Rhode Island Youth Risk Behavior Survey (YRBS), Rhode Island Hospital Discharge Data, Rhode Island ED Data, Rhode Island Vital Records, and the Pregnancy Risk Assessment Monitoring System. Additionally, this updated report includes new information on pediatric asthma claims data provided by Blue Cross Blue Shield of Rhode Island, Neighborhood Health Plan of Rhode Island, and United Healthcare of New England.

KEY FINDINGS

Adult Prevalence

- Approximately 16% of Rhode Island adults have been diagnosed with asthma at some point in their lifetime.
- Approximately 11% of Rhode Island adults currently have asthma.
- Current asthma rates are significantly higher among women than men.
- The prevalence of current asthma is significantly higher in adults aged 18 to 64 than in adults ages 65 and older.
- Current adult asthma rates are significantly higher among those with less than a high school diploma than with adults with a high school diploma or more years of formal schooling.
- Current asthma prevalence is significantly higher among adults with household incomes below \$25,000 than adults with higher household incomes.

Child Prevalence

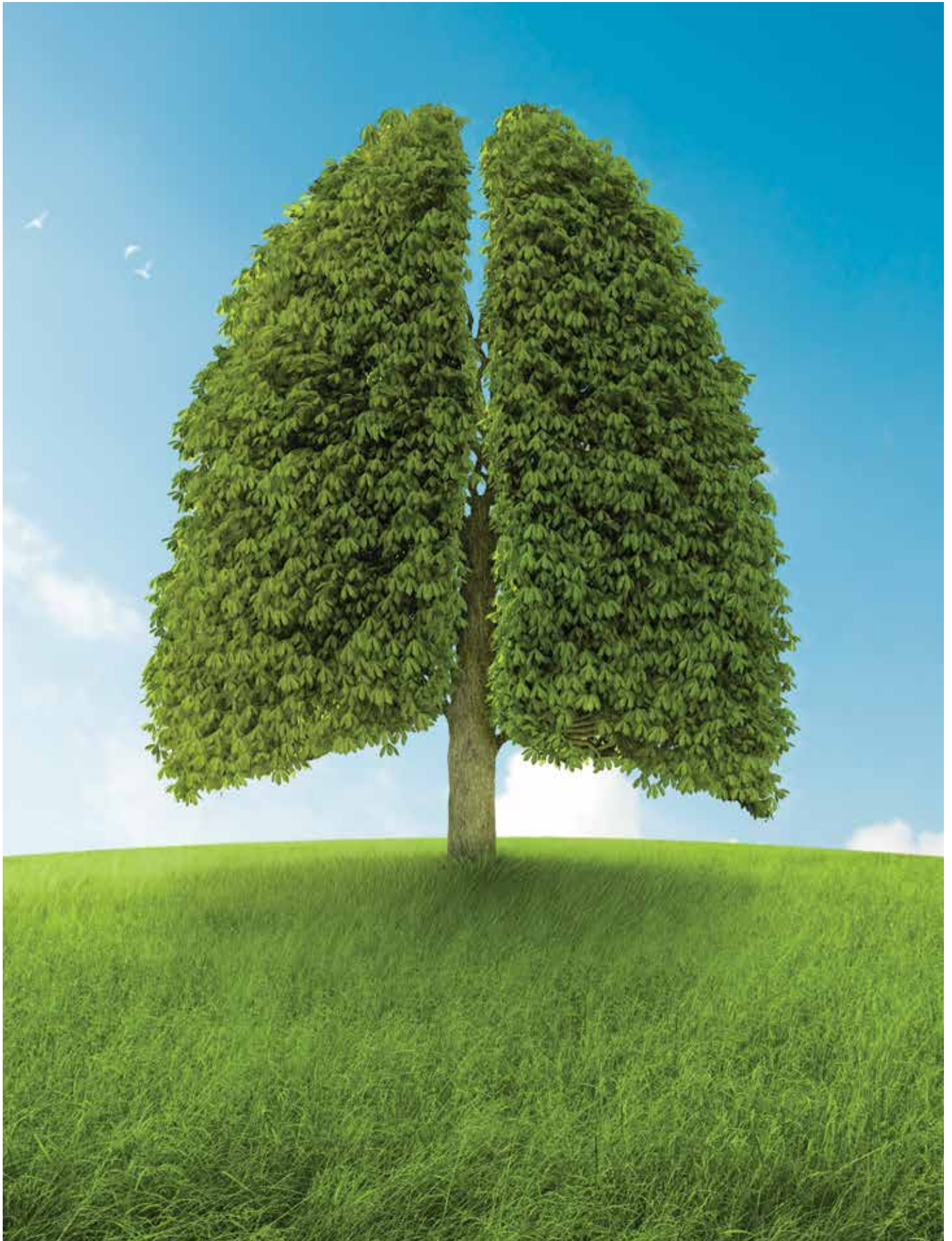
- Approximately 13% of Rhode Island children have been diagnosed with asthma at some point in their lifetime.
- Approximately 9% of Rhode Island children currently have asthma.

Hospitalizations

- Children aged 0 to 4 years have significantly higher asthma hospitalization rates than all other age groups.
- There was a significant decrease in the hospitalization rate for children age 0 to 4 years in 2011.
- The age-specific asthma hospitalization rate was significantly higher for non-Hispanic black children than for non-Hispanic white or Hispanic children.
- Hospital rates in core cities tend to be higher than the state average.
- Average charges per hospitalization for asthma in Rhode Island were approximately \$10,081 for children and \$19,739 for adults.
- Total hospital charges attributable to asthma hospitalizations in Rhode Island were approximately \$21 million in 2012.

Deaths

- Between 2007 and 2012, there was an average of 10 deaths per year in Rhode Island for which asthma was the underlying cause.
- Between 2007 and 2012, there was an average of 36 deaths per year where asthma was listed as a contributing cause of death.
- The average mortality rate between 2007 and 2011 where asthma was the underlying cause of death was 10.6 deaths per million Rhode Island adults aged 18 and older.
- The average mortality rate between 2007 and 2011 where asthma was the contributing cause of death was 42.1 deaths per one million Rhode Island residents aged 18 and older.



PREVALENCE OF ASTHMA

There are many challenges in conducting asthma surveillance. Both prevalence and mortality from asthma appear to have increased in many parts of the world during a time when better asthma medications have been available to more patients suffering from asthma. Several methods can be used to measure asthma prevalence in the US. One way to assess the prevalence of asthma is to identify persons with a diagnosis of asthma by a doctor, nurse, or other health professional. Another way to define asthma prevalence is to identify anyone with asthma-like symptoms. Wheezing, difficulty breathing, pain or tightening in the chest, and coughing are common signs and symptoms of asthma. Wheezing is a classic sign of asthma in children. However, not all children who have wheezing episodes will develop asthma, and not all children with asthma wheeze. Different definitions of asthma make it difficult to determine the absolute number or prevalence of people living with asthma at any one time. In addition, unlike many infectious and chronic diseases, there are no registries that track the number of individuals living with asthma.

ASTHMA IN ADULTS

Measuring Adult Asthma Prevalence

One available method for determining the prevalence of asthma is through health surveys. Rhode Island and the CDC track adult asthma prevalence using the Behavioral Risk Factor Surveillance System (BRFSS). This state-based, random-digit-dialed telephone survey of the non-institutionalized, civilian, adult (18 and over) population is cooperatively administered by the CDC, the 50 states, the District of Columbia, and three US territories. Once a household is selected, one adult (aged 18 or older) is randomly selected to be interviewed. BRFSS data are weighted to provide national- and state-level estimates of health risk behaviors, preventative health practices, and health care access primarily related to chronic disease and injury.

As described above, BRFSS is one of our most important surveys. It is the longest running population-based health survey in the world. The adult sample in Rhode Island BRFSS has increased from 3,544 respondents aged 18 and older in 2000 to 6,599 respondents age 18 and older in 2010. In 2010, about 52% of the weighted respondents were female, 19% were 65 years of age or older, and 90% were white non-Hispanic.

BRFSS gathers information on the prevalence of asthma using two core questions. Lifetime and current asthma (see Table 1) prevalence in adults distinguish between (a) individuals who have been diagnosed with asthma at some point in their lifetime but do not feel they currently have asthma and (b) those who currently have asthma.

The CDC made methodological changes to the BRFSS in 2011. Prior to 2011, all surveys were conducted on landline telephones. Due to the increasing popularity of cell phones as primary phones, the BRFSS transitioned to include cell phone surveys. The sample weighting methodology was also changed in 2011 from a post-stratification method to a more sophisticated iterative proportional fitting method known as raking. As a result of these changes, the results of surveys conducted in 2011 or later cannot be compared to results of surveys conducted in 2010 or earlier.

TABLE 1. LIFETIME AND CURRENT ADULT ASTHMA PREVALENCE QUESTIONS, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)

Lifetime asthma prevalence	Have you ever been told by a doctor, nurse, or other health professional that you have asthma?
Current asthma prevalence	Do you still have asthma?

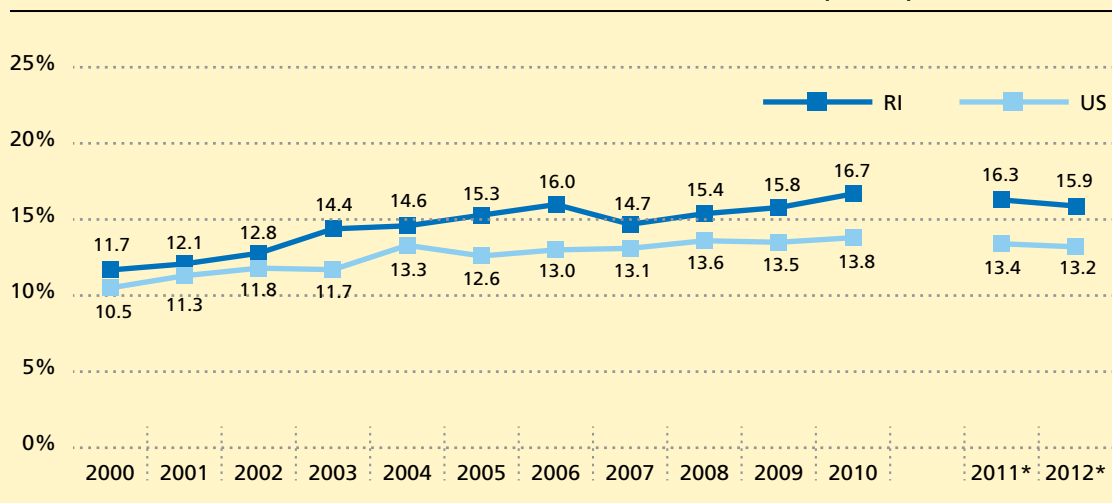
Trends in Adult Asthma Prevalence

Lifetime adult asthma rates remain consistently higher in Rhode Island than in the US as a whole. There also has been an upward trend in lifetime adult asthma rates in Rhode Island.

The percentage of Rhode Island adults ever diagnosed with asthma was significantly higher in 2010, at 16.7%, than in 2000, at 11.7%. (See Figure 1: Lifetime prevalence in 2000: 11.7%, 95% CI= 10.5% – 12.9%; Lifetime prevalence in 2010: 16.7%, 95% CI= 15.1% - 18.2%.)

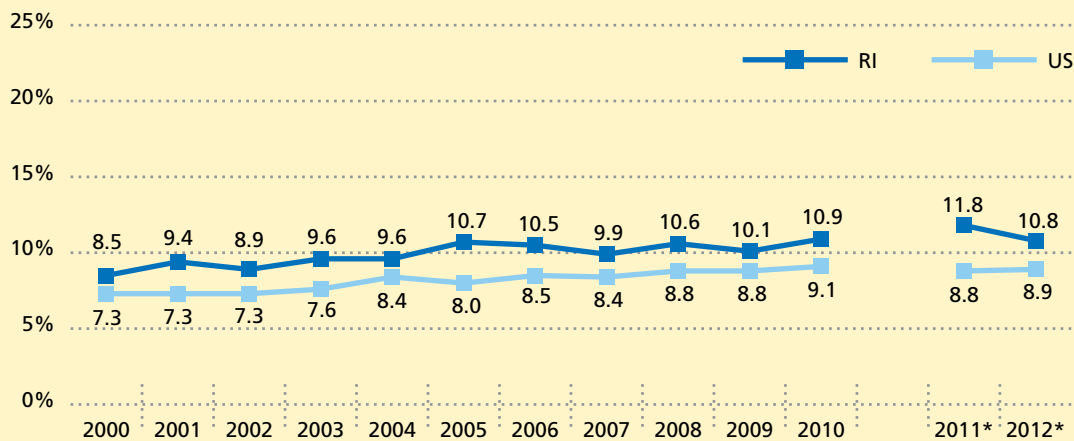
Current adult asthma rates remain slightly higher in Rhode Island than in the rest of the country. The percentage of Rhode Island adults with current asthma was significantly higher in 2010, at 8.5%, than it was in 2000, at 10.9%. (See Figure 2: Current prevalence in 2000: 8.5%, 95% CI= 7.5% - 9.5%; Current prevalence in 2010: 10.9%, 95% CI= 9.7% – 12.1%.)

FIGURE 1. TRENDS IN LIFETIME ADULT ASTHMA PREVALENCE BY YEAR, US AND RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS) 2000-2012



* 2011 or later results cannot be compared to results of surveys conducted in 2010 or earlier.
Data Source: 2000-2012 National and Rhode Island Behavioral Risk Factor Surveillance System

FIGURE 2. TRENDS IN CURRENT ADULT ASTHMA PREVALENCE BY YEAR, US AND RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS) 2000-2012



* 2011 or later results cannot be compared to results of surveys conducted in 2010 or earlier.
Data Source: 2000-2012 National and Rhode Island Behavioral Risk Factor Surveillance System

Adult Asthma Prevalence Aggregated Over Time

Trends in asthma prevalence can be tracked by looking at individual years of data or by combining several years of data. Table 2 displays the prevalence of asthma in adults based on five years of BRFSS data combined. Rhode Island’s small population makes it difficult to stratify a single year of data by demographic characteristics, such as gender, age, and race and ethnicity. By combining multiple years, data can be stratified and disparities can be identified.

Based on aggregated data for five years, approximately 15.3% of Rhode Island adults have been diagnosed with asthma at some point in their lifetime, representing an estimated 127,000 Rhode Island adults. Approximately 10.4% of Rhode Island adults currently have asthma, representing an estimated 86,000 Rhode Island adults (see Table 2).

TABLE 2. ASTHMA PREVALENCE IN ADULTS AGGREGATED OVER TIME, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2006 – 2010

	BRFSS SAMPLE	LIFETIME ASTHMA % (95% CI)	CURRENT ASTHMA % (95% CI)
Adults 18+	26,505	15.3 (14.7 – 16.0)	10.4 (9.9 -10.9)
Weighted Sample	827,638	126,932	85,968

Percentages, 95% confidence intervals and corresponding sample sizes are weighted.
Data Source: 2006-2010 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis

Disparities in Adult Asthma Prevalence

Data from 2006-2010 BRFSS combined file underscores substantial differences in current adult asthma prevalence by sex, age group, educational level, household income and race/ethnicity.

- **Gender.** Current asthma rates are significantly higher among women than men.
- **Age.** The prevalence of current asthma is significantly higher in adults aged 18 to 64 than in adults ages 65 and older.
- **Education.** Current adult asthma rates are significantly higher among those with less than a high school diploma than with adults with a high school diploma or more years of formal schooling.
- **Income.** Current asthma prevalence is significantly higher among adults with household incomes below \$25,000 than adults with higher household incomes.
- **Race and ethnicity.** There is no statistically significant variation of current asthma prevalence by race/ethnicity in adults.

TABLE 3. DISPARITIES IN CURRENT ADULT ASTHMA PREVALENCE, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2006-2010

CHARACTERISTICS OF ADULTS (18+ YEARS)	ASTHMA SAMPLE		
	UNWEIGHTED SAMPLE ¹	CURRENT ASTHMA PREVALENCE% (95% CI) ²	
Gender	Male	9,508	7.4 (6.7 – 8.1)
	Female*	16,997	13.1 (12.4 – 13.9)
Age group	18 – 64*	18,124	10.9 (10.2 – 11.5)
	65 and older	8,084	8.4 (7.7 – 9.1)
Educational Level	< HS diploma*	2,483	14.3 (12.1 – 16.6)
	HS diploma	7,464	10.2 (9.2 – 11.2)
	College or higher	16,484	10.0 (9.3 – 10.6)
Income	< \$25,000 per year*	5,843	13.4 (12.0 – 14.7)
	> \$25,000 per year	16,764	9.6 (9.0 – 10.2)
Race/Ethnicity	Hispanic	1,788	9.2 (7.2 – 11.2)
	Black, non-hispanic	829	10.6 (7.7 – 13.4)
	White, non-hispanic	22,833	10.5 (9.9 – 11.0)
Overall		26,505	10.4 (9.9 – 10.9)

MODIFIABLE RISK FACTORS FOR ADULTS

Modifiable risk factors for asthma are things that a person can control, change, or modify by shifting his/her lifestyle or taking medication to reduce risk of having more severe asthma. This section examines three modifiable risk factors shown to increase the chance that a person will have asthma symptoms or have more severe asthma once the disease develops. These risk factors include obesity, cigarette smoking, and exposure to secondhand smoke.

Obesity. Evidence is now mounting that obesity is a risk factor for asthma. Yet, little is known about how exactly obesity influences asthma. Some experts suggest that excess weight pressing on the lungs may trigger the hyper-reactive response in the airways typical of asthma. Others believe that asthma leads to obesity by inhibiting physical activity, although several studies have found no difference in activity levels between people with or without asthma. Some studies suggest that many obese people may be misdiagnosed as having asthma when in fact they are simply short of breath, possibly because of increased effort required for breathing.

Cigarette smoking. Tobacco use is associated with many chronic diseases and tobacco smoke is a powerful asthma trigger. Asthma and active cigarette smoking interact to cause more severe asthma symptoms, accelerate decline in lung function, and reduced short-term therapeutic response to corticosteroids.

Exposure to secondhand smoke. Secondhand smoke poses a serious and pervasive health risk to children and adults. According to the 2006 US Surgeon General's report, *The Health Consequences of Involuntary Exposure to Tobacco Smoke*, living with someone who smokes or having frequent, prolonged exposure to secondhand smoke, such as in a home or work setting, increases the risk for developing asthma. Of particular concern is secondhand smoke exposure in children, as there is evidence that secondhand smoke is a potent factor in the development of asthma in children.



ASTHMA RISK FACTORS IN ADULTS

BRFSS assesses asthma risk factors in adults (ages 18+). Table 4 shows the wording of risk factor questions related to asthma in BRFSS.

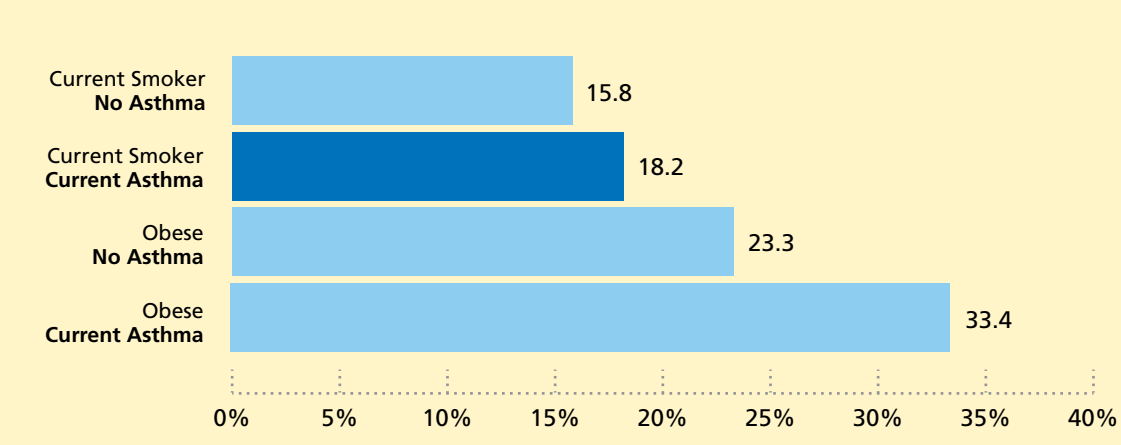
TABLE 4. ASTHMA RISK FACTOR QUESTIONS, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)

RISK FACTOR	BRFSS QUESTIONS
Weight status	Weight status is computed from a person’s self-reported height and weight and is used to calculate body mass index (BMI). Being obese is defined as a BMI of greater than or equal to 30.
Cigarette use	Smoking status is computed from a person’s response to two questions: 1) Have you smoked at least 100 cigarettes in your entire life? 2) Do you now smoke cigarettes every day, some days, or not at all?
Secondhand smoke	1) In the past 7 days, how many hours were you exposed to other people’s tobacco smoke inside your house or apartment? 2) In the past 7 days, how many hours were you exposed to other people’s tobacco smoke when you were at work?

Because BRFSS is a cross-sectional survey, it only provides information at one point in time. Thus, we cannot say whether people began smoking or became obese before they developed asthma or if people started smoking or became obese after they developed asthma.

Although the direction of causation between two variables in cross-sectional data cannot be determined, this section looks at the relationship between current asthma and health status in two ways. First, comparison is made between adults with or without current asthma with respect to weight status and smoking status. Figure 3 shows significant differences in weight status and smoking status between Rhode Island adults with asthma and those without at the time of the BRFSS survey.

FIGURE 3. WEIGHT STATUS AND SMOKING STATUS AMONG ADULTS WITH AND WITHOUT CURRENT ASTHMA, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2008-2010



Percentages are weighted.

* Indicates significance

Data Source: 2008-2010 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis

In 2008-2010 BRFSS:

Current smoker. Adults with current asthma were not significantly more likely to be current smokers (18.2%, 95% CI 15.3 - 21.0) than adults without asthma (15.8%, 95% CI= 14.9 -16.7).

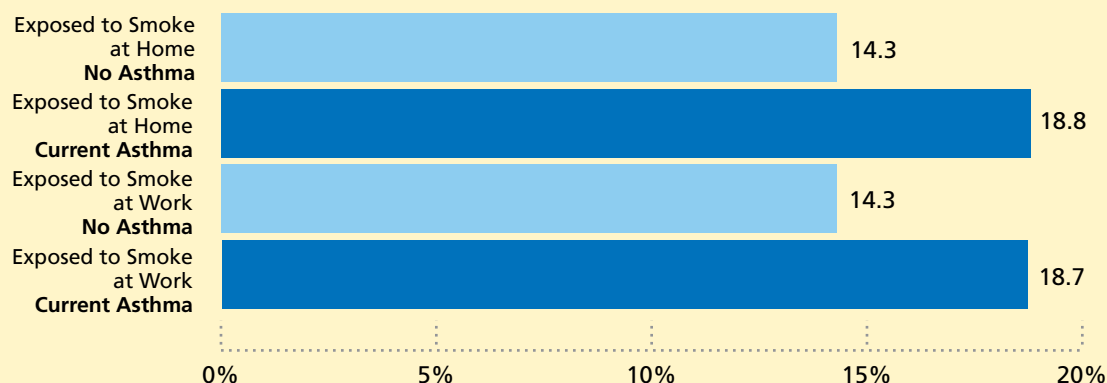
Obesity. Adults with current asthma were significantly more likely to be obese (33.4%, 95% CI= 30.3 - 36.4) than adults without current asthma (23.3%, 95% CI= 22.3 - 24.3). Being obese was defined as a body mass index (BMI) of greater than or equal to 30.

In 2007-2010 BRFSS:

Secondhand Smoke. Exposed to smoke at home. Adults with current asthma were significantly more likely to be exposed to smoke in their home (18.8%, 95% CI = 15.6 - 22.1) than adults without current asthma (14.3%, 95% CI= 13.3 - 15.3). Exposure to secondhand smoke at home was defined as having at least one hour of smoking in the home in the past seven days.

Exposed to smoke at work. Adults with current asthma were not significantly more likely to be exposed to smoke at work (18.7%, 95% CI = 13.9 - 23.5) than adults without current asthma (14.3%, 95% CI= 13.1 - 15.5). Exposure to secondhand smoke at work was defined as working inside and as having at least one hour of smoking at work in the past seven days. While there is not a significant difference in exposure to smoke at work in those with asthma and those without asthma, the results are higher in both groups than would be expected. Rhode Island passed the Smoke-Free Workplace law in 2004. These results suggest greater compliance to the law may be necessary as the percentage of people exposed to smoke at work is still higher than expected.

FIGURE 4. EXPOSURE TO SECONDHAND SMOKE AMONG ADULTS WITH AND WITHOUT CURRENT ASTHMA, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2007-2010



Percentages are weighted.

* Indicates significance

Data Source: 2007-2010 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis

QUALITY OF LIFE

Having asthma can affect every facet of a person’s daily life. If properly managed, asthma does not have to prevent a person from leading a healthy, active life. Asthma treatment goals are mainly centered on asthma control. The goals of asthma treatment are to help persons with asthma control and manage day and nighttime symptoms, to minimize activity limitations such as experiencing difficulty breathing when doing simple chores or walking, and to reduce the risk of an asthma attack. In addition, effectively managing an individual’s asthma may decrease increase health care use for persons with asthma. Health care use for asthma includes outpatient visits to doctors’ offices, clinics, visits to hospital EDs, and inpatient hospitalizations.

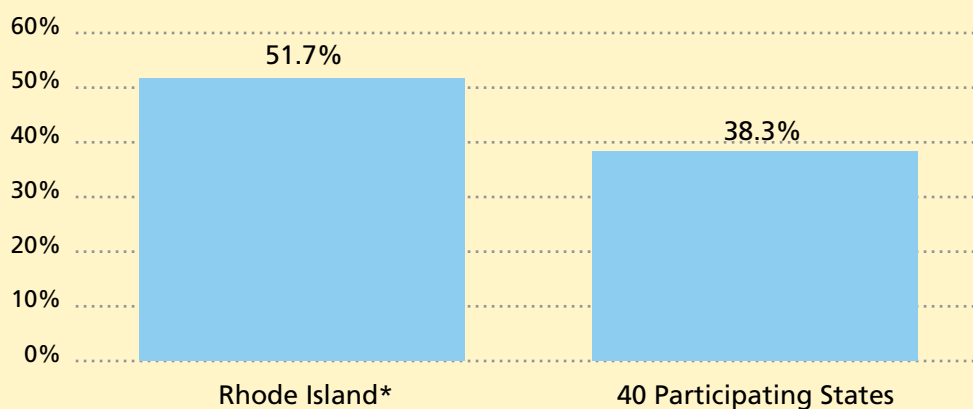
BRFSS Adult Asthma Call Back Survey (ACBS) provides information about asthma-related symptoms, quality of life, and healthcare use for persons with asthma. Due to changes in the BRFSS, surveys conducted in 2011 or later cannot be combined with or compared to surveys conducted prior to 2011. This section examines quality of life for people with asthma, including asthma’s impact on employment and co-morbidity with depression, as well as various aspects of health care utilization for individuals with asthma, including routine office visits, and use of asthma management plans.

To qualify for the Adult ACBS, BRFSS respondents must answer “yes” to questions about current or lifetime asthma (refer to Table 1) and consent to be contacted again for an additional asthma specific survey.

In 2011, 74.4% of respondents who completed the Adult ACBS reported having current asthma, totaling 248 respondents. Of those with current asthma, 88.8% were first diagnosed more than five years prior to the survey. 41.9% of those with current asthma reported having had an asthma attack within the past year, and 57.9% reported at least one routine visit for asthma in the past year. 35.2% of respondents with current asthma have an asthma action plan.

Respondents in Rhode Island did not significantly differ on most questions from the average of the 40 states and territories participating in the BRFSS ACBS. However, one significant difference in 2011 was Rhode Island respondents with current asthma were significantly more likely to report a medical diagnosis of depression than the all state total. 38.3% of US respondents with current asthma reported a medical diagnosis of depression (95% CI 36.1% - 40.5%). In Rhode Island, 51.7% of those with current asthma reported a medical diagnosis of depression (95% CI 41.1% - 62.3%).

FIGURE 5. PERCENT OF ADULT ASTHMA CALL BACK SURVEY RESPONDENTS WITH CURRENT ASTHMA REPORTING A DIAGNOSIS OF DEPRESSION, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2011



* Indicates significance

Data Source: 2011 Rhode Island Behavioral Risk Factor Surveillance System, Rhode Island Department of Health, Center for Health Data and Analysis

The societal impact of asthma includes productivity lost due to uncontrolled asthma. 32.6% of Adult ACBS respondents with current asthma reporting reported having missed work or usual activities as a result of asthma in the past year. 51.6% of respondents with current asthma reported their asthma was once caused or worsened by a job, with 20.1% reporting their asthma was caused or worsened by their current job.



MEASURING CHILD ASTHMA PREVALENCE

BRFSS

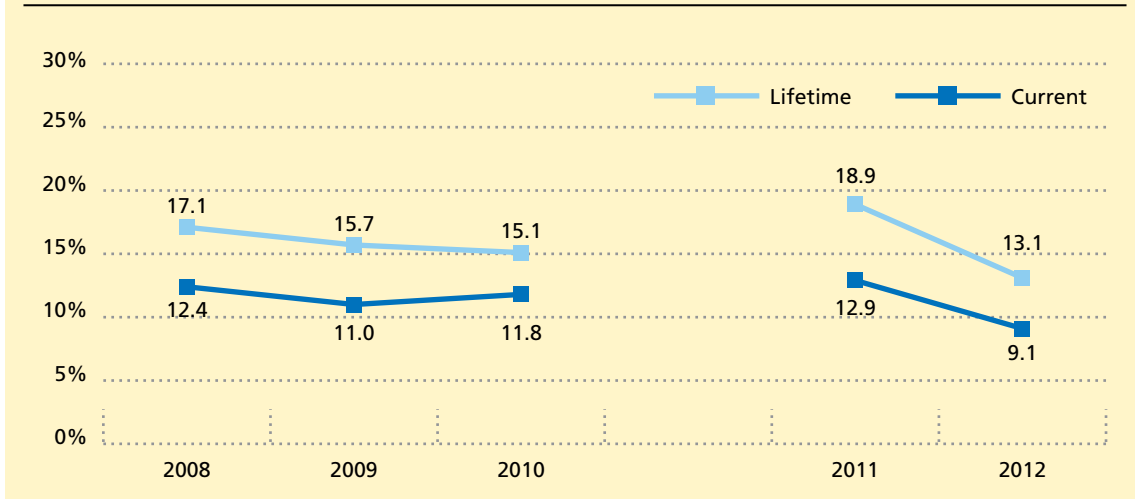
BRFSS estimates child asthma prevalence with the Child Asthma Prevalence Module, which is administered after the Random Child Selection Module. During administration of the Random Child Selection Module one child in the household is chosen at random. The asthma status of that randomly selected child is then determined using the Child Asthma Prevalence Module.

As previously mentioned, the CDC changed weighting strategies for the BRFSS in 2011. As a result of these changes, the results of surveys conducted in 2011 or later cannot be compared to results of surveys conducted in 2010 or earlier.

Between 2008 and 2010, no significant change occurred in lifetime or current pediatric asthma. Between 2011 and 2012, there was a significant decrease in reporting of lifetime pediatric asthma (Lifetime pediatric prevalence in 2011: 18.9%, 95% CI 16.4% - 21.4%. Lifetime pediatric prevalence in 2012: 13.1%, 95% CI 10.7% - 15.5%).



FIGURE 6. TRENDS IN LIFETIME AND CURRENT PEDIATRIC ASTHMA PREVALENCE BY YEAR, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2008-2012



2011 or later results cannot be compared to results of surveys conducted in 2010 or earlier. Percentages are weighted.
 Data Source: 2008-2012 Rhode Island Behavioral Risk Factor Surveillance System, Rhode Island Department of Health, Center for Health Data and Analysis

Disparities in Child Asthma Prevalence

Data from 2008-2010 BRFSS combined file underscore substantial differences in the prevalence of asthma in children by age and sex. Current asthma rates are significantly higher in the 5 to 11 years and 12 to 17 years age groups than in the 0 to 4 years age group. Due to a small a sample size, childhood asthma prevalence cannot be determined by race or ethnicity.

TABLE 5. DISPARITIES IN CURRENT PEDIATRIC ASTHMA PREVALENCE, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2008-2010

CHARACTERISTICS OF CHILDREN (0 - 17 YEARS)		UNWEIGHTED SAMPLE ¹	CURRENT ASTHMA PREVALENCE % (95% CI) ²
Gender	Male	2,340	13.0% (11.4% - 14.6%)
	Female	2,179	10.6% (9.0% - 12.2%)
Age Group	0 - 4	998	8.4% (6.1% - 10.7%)
	5 - 11	1,510	13.1% (11.1% - 15.1%)
	12 - 17	1,709	13.7% (11.8% - 15.5%)
Overall		4,526	11.7% (10.6-12.8%)



BRFSS Child Asthma Call Back Survey

Rhode Island added the BRFSS Child Asthma Call Back Survey (ACBS) in 2008. The Child ACBS provides information about asthma-related symptoms, quality of life, and health-care use for children with asthma. To qualify for the child ACBS, BRFSS respondents must answer “yes” to questions about current or lifetime asthma during the Child Asthma Prevalence Module and consent to be contacted again for an additional asthma specific survey. Between 2008 and 2010, Rhode Island Child ACBS had 237 respondents.

- 73.9% of children had current asthma.
- 56.3% of those reporting current asthma reported an asthma attack in the past year.
- 67.5% of those with current asthma reported having one or more routine visit(s) with a doctor in the past year.
- 43.6% with current asthma reported having an asthma management plan.
- 45.9% with current asthma reported activity limitations due to asthma.
- 41.3% with current asthma reported missing school or daycare in the past year.

National Survey for Children’s Health

The National Survey for Children’s Health (NSCH) is a national telephone survey conducted in both English and Spanish. A household is contacted at random, and one child under 18 living in that household is randomly selected to be the subject of the survey. In the 2011/2012 survey, 10.9% of Rhode Island children were estimated to have asthma (95% CI 8.8% - 12.9%). The national 2011/2012 NSCH estimate for children with asthma was 8.8% (95% CI 8.4% - 9.2%). Most Rhode Island respondents described the asthma as mild (7.2%, 95% CI 5.5% - 8.9%).

ASTHMA PREVALENCE IN MIDDLE AND HIGH SCHOOL STUDENTS

Youth Risk Behavior Surveillance Survey

The Youth Risk Behavior Surveillance Survey (YRBS) is a survey administered every other year to public high school and middle school students in Rhode Island to assess health risk behaviors. The survey is administered by the Rhode Island Department of Health in collaboration with the Rhode Island Department of Education, with guidance from CDC.

Lifetime asthma prevalence	Have you ever been told by a doctor, nurse, or other health professional that you have asthma?
Current asthma prevalence	Do you still have asthma?

In 2011, two asthma-related questions assessed lifetime asthma prevalence and current asthma prevalence using similar wording as BRFSS (see Table 5). In 2011, 3,977 high school students and 3,306 middle school students responded to the survey. The weighted, self-reported data presented here are representative of public middle and high school students statewide and can be used to make important inferences about asthma prevalence among pre-teens and teens enrolled in public schools. YRBS survey results are only representative of the public middle and high school population in Rhode Island—not of all Rhode Island youth.

Data from 2011 YRBS show that 13.9% of Rhode Island high school and 13.1% of Rhode Island middle school students currently have asthma (95% CIs 12.5% – 15.5% and 11.5% – 14.8%, respectively). Nationally, 11.9% of high school students in the YRBS reported being diagnosed with asthma and still had asthma at the time of the 2011 survey (95% CI 10.9% – 12.9%). National estimates are not available for the middle school survey.

Acute depression was significantly more common in Rhode Island high school students with current asthma (29.6%, 95% CI 25.5% - 33.8%) than in Rhode Island high school students without current asthma (22.7%, 95% CI 22.1% - 25.3%). In the 2011 YRBS, Rhode Island high school students with current asthma were not significantly more likely to report drug or alcohol use, tobacco use, obesity, physical inactivity, or poor nutrition when compared to Rhode Island students without current asthma.

¹Gold DR, Wright R. Population disparities in asthma. *Ann Rev Public Health.* 2005; 26:89-113.

²Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. Behavioral Risk Factor Surveillance System. About the BRFSS. Available at: <http://www.cdc.gov/brfss/about/>

³Vortmann M, Eisner MD. BMI and Health Status among adults with asthma. *Obesity.* 2008; 16:146-152.

⁴Piipari R, Jaakkola JJK, Jaakkola N, et al. Smoking and asthma in adults. *Eur Respir J.* 2004; 24:734-739

⁵United States Department of Health and Human Services. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. June 27, 2006. Available at: <http://www.surgeongeneral.gov/library/reports/secondhandsmoke/index.html>

⁶Child and Adolescent Health Measurement Initiative (2012). "Fast Facts: 2011/12 National Survey of Children's Health." Data Resource Center, supported by Cooperative Agreement 1 U59 MC06980 01 from the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB). Available at www.childhealthdata.org. Revised 1/10/13.

⁷National Survey of Children's Health. NSCH 2011/12. Data query from the Child and Adolescent Health Measurement Initiative, Data Resource Center for Child and Adolescent Health website. Available at: www.childhealthdata.org.

⁸Rhode Island Department of Health. Center for Health Data and Analysis. Description of Data Systems. Available at: <http://www.health.ri.gov/programs/healthdataandanalysis/>



INPATIENT HOSPITALIZATIONS

This section presents information on asthma-related hospitalization rates to determine trends over time and identify population groups most likely to have an asthma-related admission. Records of asthma-related hospital admissions 2000 to 2012 were extracted from the Rhode Island Hospital Discharge Data. All of Rhode Island's acute care, non-federal hospitals are required to report hospital discharges to the state according to licensure regulations effective January 1, 1989. The files include surveillance information, such as patient demographics, primary and additional diagnoses, and charges. Calculations of hospitalization counts and rates are based on the number of hospitalizations, not on the number of individuals hospitalized. An individual may have more than one hospitalization within a reporting period; therefore the number of individuals with asthma hospitalizations cannot be directly captured in these calculations, because the data are not adjusted for repeated hospital admissions.

Data are based on Rhode Island residents who were seen at a Rhode Island hospital with a diagnosis of asthma (ICD-9CM codes 493.00-493.92). In 2012, for example, there were 1,321 hospital admissions where asthma was the primary diagnosis. Ninety-six percent of these admissions were from individuals residing in Rhode Island, 3% were residents residing in Massachusetts, 0.5% were residents residing in Connecticut, and 0.5% resided in another state outside of Rhode Island, Massachusetts, or Connecticut. Therefore, rates are representative of asthma hospitalizations among Rhode Island residents, but slightly underestimate the total number of asthma hospitalizations in Rhode Island hospitals.

Defining an Asthma Hospitalization

Two types of diagnosis codes are given in hospital discharge records; principal diagnosis and underlying diagnosis. A principal diagnosis refers to the primary reason for which the patient was hospitalized. An underlying diagnosis refers to related conditions, which may have contributed to the patient's hospitalization. The Rhode Island Hospital Discharge Data includes one field for a primary diagnosis and up to 24 additional or underlying diagnoses.

Calculating an Asthma Hospitalization Rate

- 1) **Crude Rate.** To calculate a crude rate, the number of hospitalizations in a given time period is divided by the size of the population in the time period times a multiplier of 10.
- 2) **Age-Specific Hospitalization Rate.** An age-specific hospitalization rate is a measure of how common something is in a certain age group. It is calculated as the number of people hospitalized for asthma at in a certain year, divided by the population of that age in a certain year, divided by the population of that age group in that year times a multiplier of 10. Age-specific rates also can be calculated for population subgroups defined by race, sex, or other demographic characteristics.



- 3) **Age-Adjusted Hospitalization Rate.** Almost all disease or health outcomes occur at different rates in different age groups. Most chronic diseases occur more often among older people. Other outcomes, such as many types of injuries, occur more often among younger people. A community with older individuals will have higher crude rates of chronic diseases than one with younger individuals. Thus the age distribution of a community can affect rates of diseases and injuries, hospital, and mortality rates. An age-adjusted rate removes confounding caused by age. Age-adjustment is a statistical procedure accomplished by first multiplying the age-specific rates of disease by age-specific weights. Rates that are based on the same age distribution allow for direct comparison of the change in rates over time by controlling for fluctuations in the age distribution of different population subgroups. Age-adjusted rates can be calculated for population subgroups defined by race, sex, or other demographic characteristics.

Disparities in Age-Specific Asthma Hospitalization Rates

Age Group

In Rhode Island, children aged 0 to 4 years have significantly higher asthma hospitalization rates than all other age groups. There was a significant decrease in the hospitalization rate for children age 0 to 4 years in 2011 and 2012 compared to 2010.

Data presented in Table 7 show that trends in age-adjusted asthma hospitalization rates vary by gender and race.

TABLE 7. ANNUAL AND AVERAGE AGE-SPECIFIC ASTHMA¹ HOSPITALIZATION RATES² AND OVERALL AGE-ADJUSTED ASTHMA HOSPITALIZATION RATES³, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000-2012

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average
Ages 0-4	29.8	47.8	52.6	57.7	50.4	49.9	51.7	44.8	49.4	57.2	49.2	29.6	31.6	46.5
Ages 5 - 17	10.4	10.9	11.1	11.8	10.1	10.0	7.7	10.8	13.1	14.1	13.5	12.5	11.5	11.3
Ages 18 - 64	10.1	9.7	9.8	10.6	9.7	11.0	11.0	10.7	10.8	11.9	11.2	10.8	9.3	10.5
Ages 65+	10.9	17.0	16.4	19.4	18.7	23.8	22.9	20.7	23.3	24.6	19.9	21.7	17.5	19.7
Age Adjusted	11.6	13.5	13.8	15.2	13.7	15.2	14.7	14.3	15.5	17.0	15.3	13.8	12.3	14.3

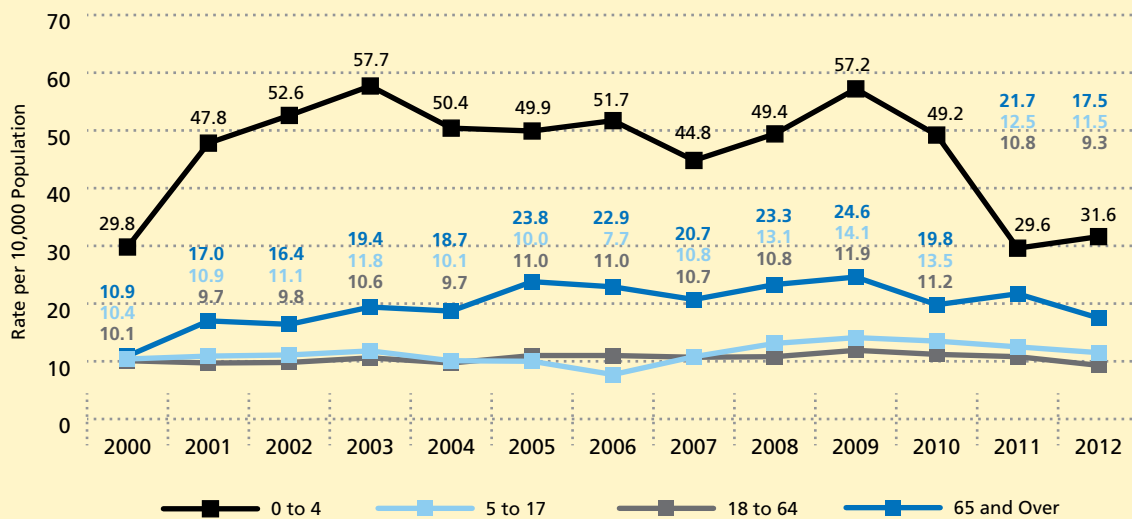
1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 population

3 Age-adjusted to the year 2000 US standard population

Data source 2000-2012 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis

FIGURE 7. ANNUAL AGE-SPECIFIC ASTHMA¹ HOSPITALIZATION RATES², RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000-2012



1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 population

Data source 2000-2012 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis

Sex and Age Group

The average age-specific asthma hospitalization rate in male children was 1.6 times the rate of the average age-specific asthma hospitalization rate in female children. In contrast, the average age-specific asthma hospitalization rate for female adults age 18 to 64 was 2.4 times the rate of the average age-specific asthma hospitalization rate in men age 18 to 64. There were significant decreases in the hospitalization rate for male children age 0 to 4 years in 2011 and 2012 compared to 2010, and in the hospitalization rate for female children age 0 to 4 years in 2011 and 2012 compared to 2009. A significant decrease was also noted in males 65 years and older in 2012 compared to 2011.

TABLE 8. ANNUAL AND AVERAGE AGE-SPECIFIC¹ ASTHMA HOSPITALIZATION RATES² AND OVERALL AGE-ADJUSTED ASTHMA HOSPITALIZATION RATES³ BY SEX AND AGE GROUP, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000-2012

	Ages	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average
Female	0-4	29.8	47.8	52.6	57.7	50.4	49.9	51.7	44.8	49.4	57.2	49.2	29.6	31.6	46.5
	5 - 17	10.4	10.9	11.1	11.8	10.1	10.0	7.7	10.8	13.1	14.1	13.5	12.5	11.5	11.3
	18 - 64	10.1	9.7	9.8	10.6	9.7	11.0	11.0	10.7	10.8	11.9	11.2	10.8	9.3	10.5
	65+	10.9	17.0	16.4	19.4	18.7	23.8	22.9	20.7	23.3	24.6	19.9	21.7	17.5	19.7
Male	0-4	38.3	62.0	68.2	72.3	61.7	62.2	64.3	55.4	61.0	74.9	66.1	34.5	39.7	58.8
	5 - 17	13.2	12.5	12.4	12.8	10.6	10.5	8.3	12.4	17.1	17.0	15.0	14.3	13.7	13.0
	18 - 64	5.8	5.1	5.3	5.4	4.9	6.1	5.4	6.1	6.7	6.8	6.8	5.9	5.4	5.8
	65+	4.2	8.2	8.1	11.1	10.5	13.6	12.1	10.8	13.4	15.4	12.4	14.0	7.8	10.9
Age Adjusted		11.6	13.5	13.8	15.2	13.7	15.2	14.7	14.3	15.5	17.0	15.3	13.8	12.3	14.3

1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 population

3 Age-adjusted to the year 2000 US standard population

Data source 2000-2012 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis

Race and Age Group

Table 9 shows pediatric asthma hospitalization rates stratified by race. In Rhode Island, the age-specific asthma hospitalization rate was higher for non-Hispanic black children than for non-Hispanic white or Hispanic children. The average twelve-year (2001-2012) pediatric age-specific asthma hospitalization rate for non-Hispanic black children was 43.8 per 10,000 compared to 25.9 per 10,000 for Hispanic children and 16.5 per 10,000 for non-Hispanic white children. From 2009 to 2012, the overall pediatric asthma hospitalization rate significantly decreased from 25.6 per 10,000 to 16.6 per 10,000. This statistically significant decrease was consistent in white non-Hispanic (19.7 per 10,000 to 13.9 per 10,000), black non-Hispanic (70.2 per 10,000 to 38.1 per 10,000), and Hispanic children (31.5 per 10,000 to 18.9 per 10,000).

TABLE 9. ANNUAL AND AVERAGE AGE-SPECIFIC PEDIATRIC ASTHMA¹ HOSPITALIZATION RATES² BY RACE, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2001 - 2012³

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average
Children, ages 0 - 17	White, non-Hispanic	17.0	18.2	19.3	17.4	16.6	14.9	16.8	16.6	19.7	16.2	13.0	13.9	16.5
	Black, non-Hispanic	38.4	43.1	39.2	39.9	34.0	44.5	40.6	55.4	70.2	53.9	42.4	38.1	43.8
	Hispanic	22.3	27.3	31.0	26.4	27.2	22.7	28.8	32.3	31.5	31.7	21.7	18.9	25.9
	Overall	20.4	21.8	23.7	20.6	20.4	19.1	21.1	22.7	25.6	22.7	16.9	16.6	20.5

1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 population

3 Data for 2000 are not shown because less than 50 children hospitalized for asthma were non-Hispanic black or Hispanic.

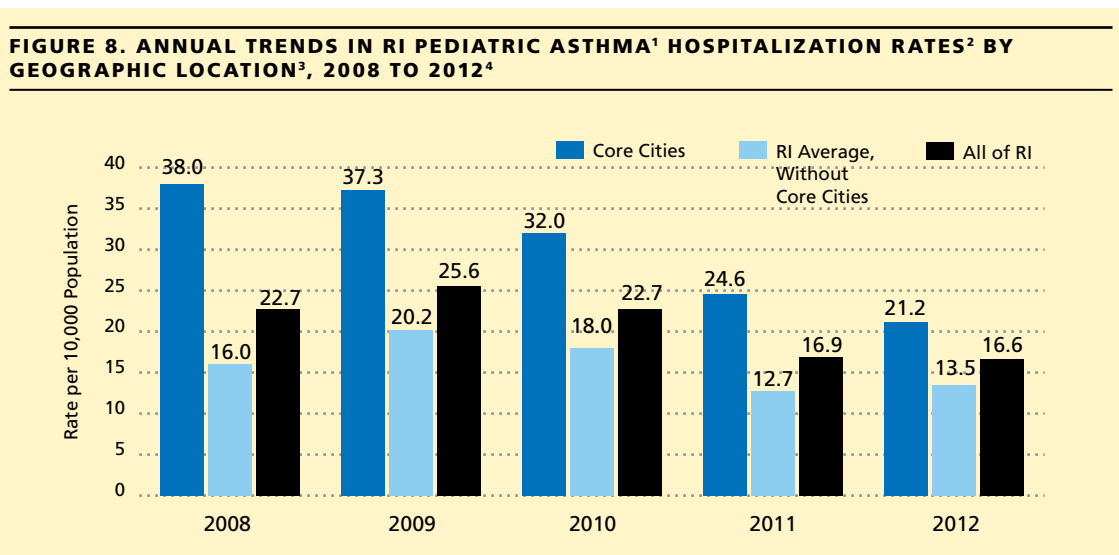
Data source 2001-2012 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis



Geography and Asthma Hospitalizations

Hospital rates in core cities tend to be higher than the state average. In 2012, the hospitalization rate in the core cities was 21.2 per 10,000 people, while the state average was 16.6 per 10,000 people. Rhode Island defines a core city as a city where 25% or more of children live below the poverty threshold. The four core cities are Central Falls, Pawtucket, Providence, and Woonsocket.

Pediatric hospitalization rates due to asthma are significantly higher in the core cities than in the remainder of Rhode Island or Rhode Island as a whole. However, between 2008 and 2012, the core cities and the state as a whole had a significant decrease in pediatric hospitalization rates due to asthma, while the rates in the remainder of the state did not have a significant change.



1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 population

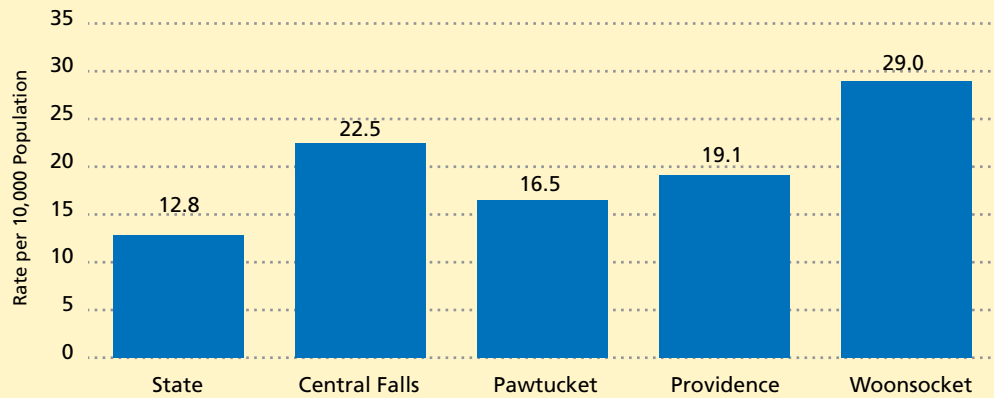
3 Core city is defined as a city where 25% or more of children live below the poverty threshold. The four core cities are Central Falls, Pawtucket, Providence, and Woonsocket.

4 Core city population determined by the 2010 census

Data source 2008-2012 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis

In 2011 and 2012 combined, Woonsocket had the highest overall rate of hospitalizations due to asthma with an average annual rate of 29.0 per 10,000. Among the core cities, Pawtucket had the lowest overall hospitalization rate of 16.5 per 10,000.

FIGURE 9. RI ALL AGE ASTHMA¹ HOSPITALIZATION RATES² BY CORE CITY³, 2011-2012



1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

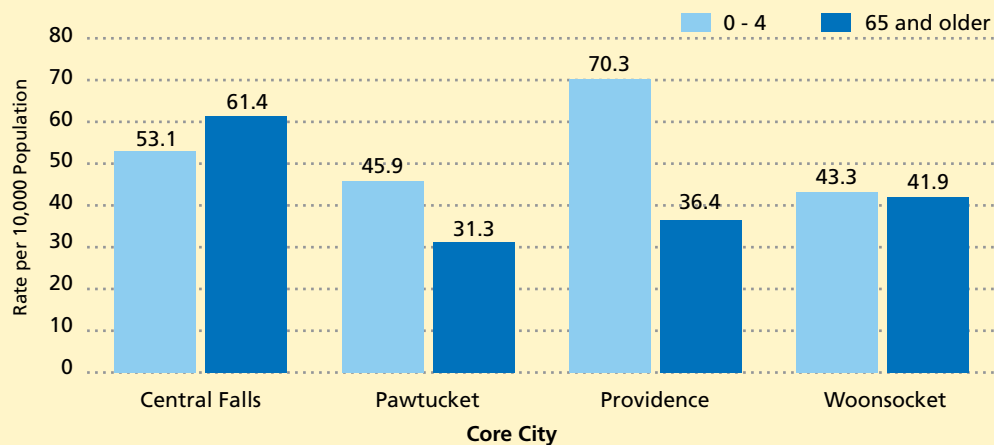
2 All rates are per 10,000 population

3 Core city is defined as a city where 25% or more of children live below the poverty threshold. The four core cities are Central Falls, Pawtucket, Providence, and Woonsocket.

Data source 2010 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis

Disparities due to age in asthma hospitalizations exist within the core cities. In the 2007-2012 six year combined period, Providence had the highest rate of hospitalizations due to asthma among children ages zero to four years (70.3 per 10,000). Central Falls had the highest rate of hospitalizations due to asthma for adults 65 years or older (61.4 per 10,000).

FIGURE 10. RI ASTHMA¹ HOSPITALIZATION RATES² BY CORE CITY³ AND AGE GROUP, 2007-2012



1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 population

3 Core city is defined as a city where 25% or more of children live below the poverty threshold. The four core cities are Central Falls, Pawtucket, Providence, and Woonsocket.

Data source 2010 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis

Health Care Resources used for Asthma Hospitalizations

Average and total charges for hospitalization in Rhode Island in 2011 and 2012 are shown in Table 9. In order to look at charges by patient characteristics, two years of hospitalization data must be combined. In 2011-2012, average charges per hospitalization for asthma in Rhode Island were approximately \$10,081 for children and \$19,7389 for adults. Total hospital charges attributable to asthma hospitalizations in Rhode Island were approximately \$25 million in 2011 and \$21 million in 2012.

TABLE 10. NUMBER OF ASTHMA¹ HOSPITALIZATIONS, AVERAGE CHARGE PER ASTHMA HOSPITALIZATION, AND TOTAL ASTHMA HOSPITALIZATION CHARGES BY PATIENT CHARACTERISTICS, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2011 AND 2012

CHARACTERISTIC		HOSPITAL VISITS	AVERAGE CHARGE	TOTAL CHARGES
All events		2,701	\$17,128	\$46,264,793
Children 0 - 17		730	\$10,081	\$7,359,345
Age	0-4	340	\$9,665	\$3,286,248
	5-9	233	\$9,834	\$2,291,423
	10-14	111	\$11,044	\$1,225,941
	15-17	46	\$12,081	\$555,733
Sex	Male	444	\$10,169	\$4,515,055
	Female	286	\$9,945	\$2,844,290
Race	Hispanic	190	\$10,614	\$2,016,736
	Black	124	\$11,106	\$1,377,218
	White	373	\$9,447	\$3,524,071
	Other	43	\$10,263	\$441,320
Payer	Ritecare/Medicaid	348	\$11,327	\$3,941,807
	Self pay	42	\$9,370	\$393,550
	Commercial	339	\$8,907	\$3,019,796
	Unknown	-	-	-
Adults total		1,971	\$19,738	\$38,905,448
Age	18-44	538	\$16,504	\$8,879,618
	45-64	822	\$20,317	\$16,701,274
	65+	611	\$21,807	\$13,324,556
Sex	Male	518	\$17,552	\$9,092,433
	Female	1,453	\$20,518	\$29,813,015
Race	Hispanic	271	\$16,439	\$4,455,207
	Black	224	\$15,598	\$3,494,054
	White	1,408	\$20,978	\$29,537,784
	Other	68	\$20,858	\$1,418,403
Payer	Medicaid	416	\$18,169	\$7,558,450
	Self-payer	232	\$16,980	\$3,939,499
	Medicare	908	\$21,522	\$19,542,451
	Commercial	391	\$18,695	\$7,309,823

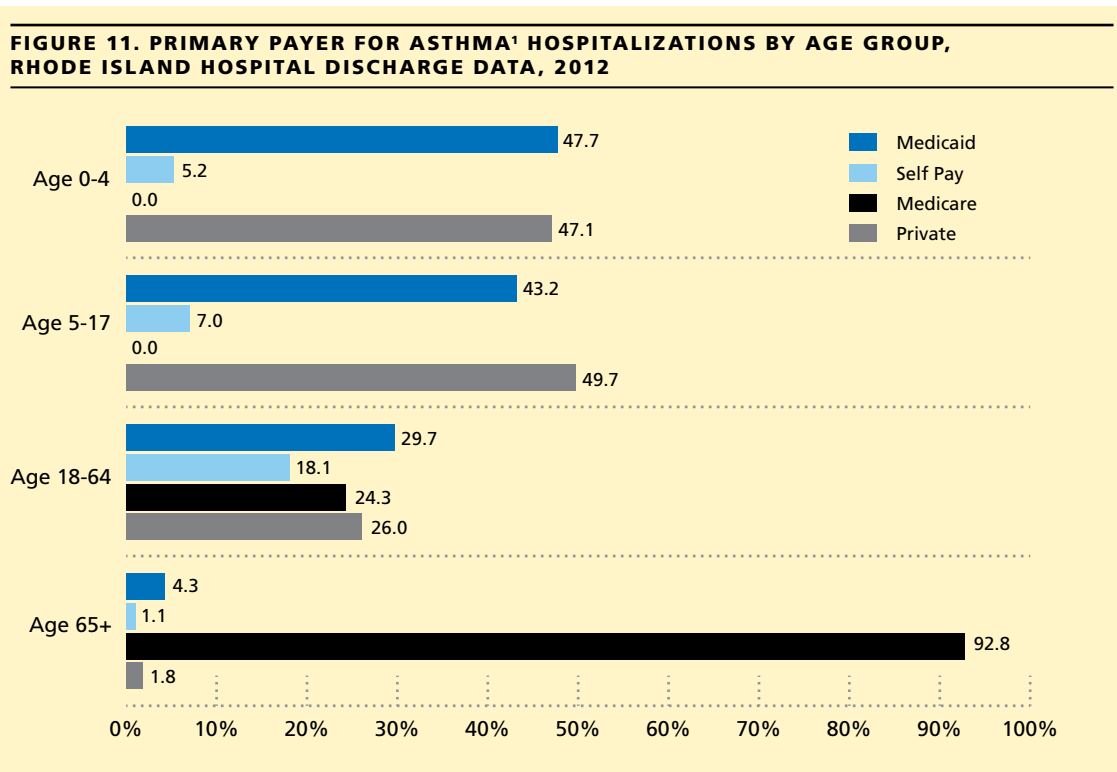
- = Data suppressed due to low numbers. Not enough cases for analysis.

¹ Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

Data source 2012 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis

Asthma Hospitalizations by Primary Payer

Figure 11 shows the primary payer for asthma hospitalizations by age group. In 2012, Medicaid insured 47.7% of children ages zero to four years with an asthma hospitalization. Medicare was billed for 92.8% of asthma hospitalizations for patients aged 65 years or older.



1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)
 Data source 2012 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis



EMERGENCY DEPARTMENT VISITS

Rhode Island began surveillance of emergency department (ED) visits in 2005. Records of asthma-related ED visits (2005-2012) were extracted from the Rhode Island Emergency Department and Observation Data. The data are collected through a system of hospital-based reporting tools established by regulations promulgated by the Rhode Island Department of Health under its licensure authority, which requires hospitals to report patient-level data on all ED visits and observation stays.

Disparities in Emergency Department Visits

Age

ED age-specific rates for children ages zero to four years old is consistently and significantly higher than age-specific rates for age groups zero to 17, 18 to 64, and 65 years or older. Evidence based interventions beginning in 2009 were targeted to pediatric asthma, specifically ages zero to four years. ED rates for children ages zero to four years old decreased significantly between 2009 and 2010 (191.2 and 166.3 per 10,000, respectively), and again between 2011 and 2012 (168.5 and 136.6 per 10,000, respectively). Despite the significant decrease in the zero to four years age group, it is still significantly higher than any other age group.



TABLE 11. ANNUAL AND AVERAGE AGE-SPECIFIC ASTHMA¹ EMERGENCY DEPARTMENT RATES² AND OVERALL AGE-ADJUSTED³ ASTHMA EMERGENCY DEPARTMENT VISIT RATES, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2005-2012

	2005	2006	2007	2008	2009	2010	2011	2012	Average
Ages 0-4	167.6	172.9	176.0	192.0	191.2	166.3	168.5	136.6	171.8
Ages 5 - 17	63.4	64.3	66.0	73.2	81.1	70.3	77.6	77.1	71.4
Ages 18-64	58.3	56.9	56.3	58.7	57.3	51.1	51.2	54.8	55.6
Ages 65+	39.4	34.4	30.7	36.1	35.6	30.0	33.2	31.8	33.9
Age Adjusted	64.4	63.5	63.2	67.8	68.3	60.0	62.0	61.8	63.9

1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 population

3 Age-adjusted to the year 2000 US standard population

Data source 2005-2012 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis

Gender and Age Group

The age and gender specific asthma ED visit rates in Rhode Island show that the use of the emergency room for asthma differs for males and females. Among children younger than five, males are more likely to have an ED visit for asthma than females. The eight-year average rate for males ages zero to four years was 222.7 per 10,000 and 118.5 per 10,000 for females. Among adults, females are more likely than males to have an ED visit for asthma. The eight-year average rate for females ages 18 to 64 years was 72.9 per 10,000 and 37.6 per 10,000 for males. ED rates for female children ages zero to four years old decreased significantly between 2009 and 2010 (130.9 per 10,000 to 103.29 per 10,000, respectively). ED rates for male children ages zero to four years old decreased significantly between 2011 and 2012 (220.9 per 10,000 to 182.1 per 10,000, respectively). While rates in the zero to four years age group have significantly trended downward, the rates remain significantly higher than the other age groups regardless of gender.

TABLE 12. ANNUAL AND AVERAGE AGE-SPECIFIC ASTHMA¹ EMERGENCY DEPARTMENT RATES² AND OVERALL AGE-ADJUSTED³ ASTHMA EMERGENCY DEPARTMENT VISIT RATES BY SEX AND AGE GROUP, RHODE ISLAND EMERGENCY DEPARTMENT DATA, 2005-2012

		2005	2006	2007	2008	2009	2010	2011	2012	Average
Female	Ages 0-4	120.5	124.9	130.7	131.8	130.9	103.2	113.4	88.7	118.5
	Ages 5 - 17	57.0	55.9	57.9	64.6	68.7	56.2	66.8	65.1	61.4
	Ages 18-64	76.3	76.4	74.6	75.0	76.0	68.7	67.5	69.1	72.9
	Ages 65+	47.9	43.1	39.0	46.7	43.0	34.8	41.0	40.8	42.0
Male	Ages 0-4	212.3	219.0	219.4	249.7	249.0	226.6	220.9	182.1	222.7
	Ages 5 - 17	69.5	72.4	73.6	81.3	92.8	83.8	87.8	88.4	80.9
	Ages 18-64	39.6	36.9	37.5	41.9	38.1	32.8	34.2	40.0	37.6
	Ages 65+	26.5	21.4	18.3	20.4	24.8	23.1	22.1	19.3	22.0
Age Adjusted		64.4	63.5	63.2	67.8	68.3	60.0	62.0	61.8	63.9

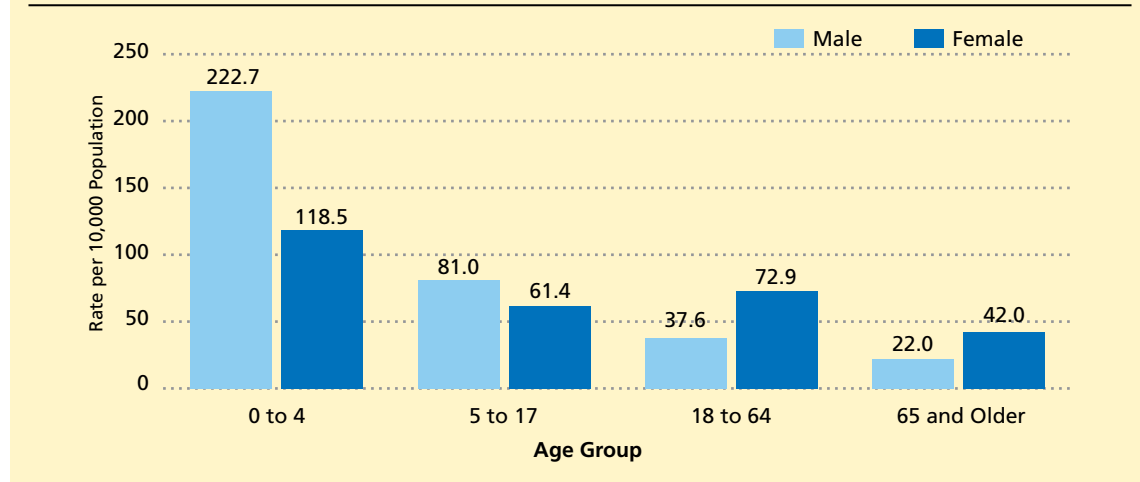
1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 population

3 Age-adjusted to the year 2000 US standard population

Data source 2005-2012 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis

FIGURE 12. AVERAGE AGE-SPECIFIC ASTHMA¹ EMERGENCY DEPARTMENT RATES² BY GENDER AND AGE GROUP, 2005-2012



1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)
 2 All rates are per 10,000 population
 Data source 2005-2012 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis

Race

In Rhode Island, the age-specific asthma ED visits rate was higher for non-Hispanic black children than for non-Hispanic white or Hispanic children. The average eight-year (2005-2012) pediatric age-specific asthma ED rate for non-Hispanic black children was 230.4 per 10,000 compared to 153.1 per 10,000 for Hispanic children and 67.5 per 10,000 for non-Hispanic white children. From 2009 to 2012, there was a significant decrease in pediatric asthma ED rates of white non-Hispanic (77.1 per 10,000 to 63.0 per 10,000), black non-Hispanic (280.3 per 10,000 to 218.9 per 10,000), and Hispanic children (167.9 per 10,000 to 142.4 per 10,000).

TABLE 13. ANNUAL AND AVERAGE AGE-SPECIFIC PEDIATRIC ASTHMA¹ EMERGENCY DEPARTMENT VISIT RATES BY RACE², RHODE ISLAND EMERGENCY DEPARTMENT DATA, 2005 – 2012

	2005	2006	2007	2008	2009	2010	2011	2012	Average
Children									
Ages 0-17									
White, non-Hispanic	66.2	64.4	69.0	73.6	77.1	63.2	63.5	63.0	67.5
Black, non-Hispanic	185.6	199.4	223.5	251.0	280.3	239.7	245.1	218.9	230.4
Hispanic	141.1	152.3	140.6	158.7	167.9	148.7	173.0	142.4	153.1
Overall	90.4	92.5	94.7	104.6	110.7	95.0	100.8	92.2	97.6

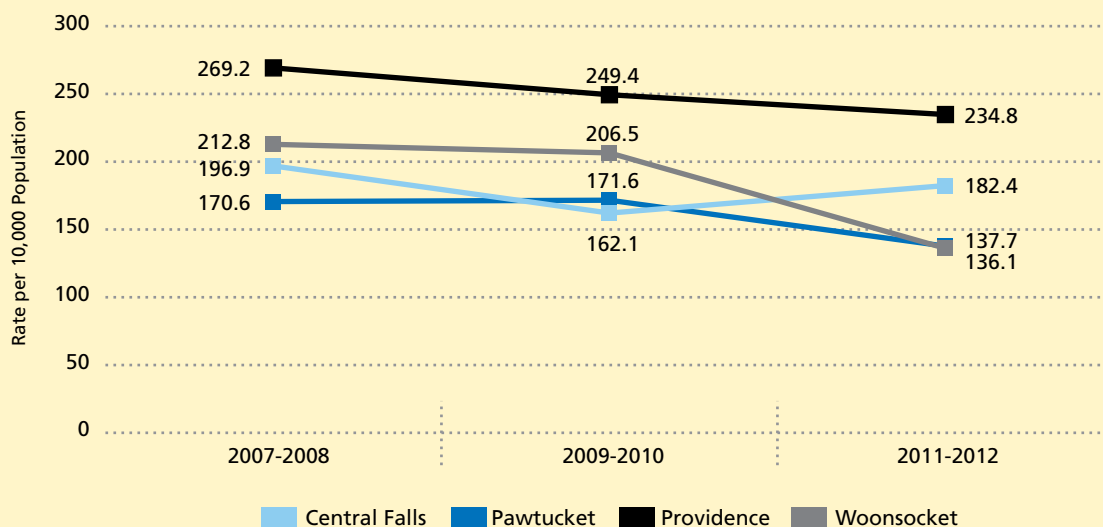
1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)
 2 All rates are per 10,000 population
 3 Age-adjusted to the year 2000 US standard population
 Data source 2005-2012 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis



Geography and Asthma Emergency Department Visits

ED rates in core cities tend to be higher than the state average. Rhode Island defines a core city as a city where 25% or more of children live below the poverty threshold. The four core cities are Central Falls, Pawtucket, Providence, and Woonsocket. Woonsocket was the only core city that experienced a significant change in ED rates. Woonsocket ED rates for both zero to 17 years and zero to four years decreased significantly in the 2011-2012 combined two year period when compared to the 2009-2010 combined period. The rate for the zero to 17 years old group decreased from 197.5 per 10,000 to 146.5 per 10,000. The rate for zero to four years old group decreased from 206.5 per 10,000 to 136.1 per 10,000.

FIGURE 13. EMERGENCY DEPARTMENT RATES¹ DUE TO ASTHMA² BY CORE CITY³ FOR CHILDREN UNDER 5 YEARS, 2007-2012



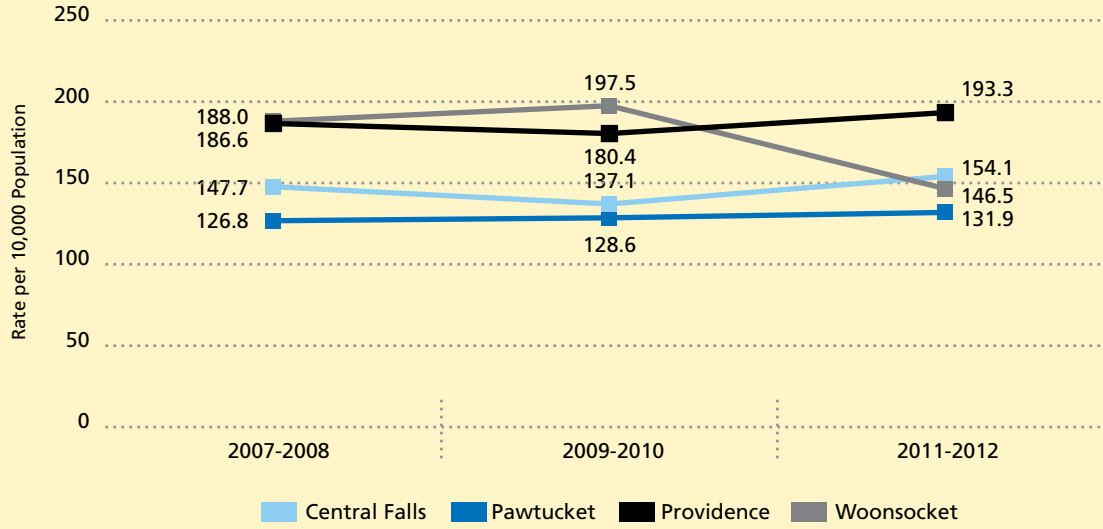
¹ All rates are per 10,000 population

² Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

³ Core city is defined as a city where 25% or more of children live below the poverty threshold. The four core cities are Central Falls, Pawtucket, Providence, and Woonsocket

Data source 2005-2012 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis

FIGURE 14. PEDIATRIC (0-17) EMERGENCY DEPARTMENT RATES¹ DUE TO ASTHMA² BY CORE CITY³, 2007-2012



1 All rates are per 10,000 population

2 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

3 Core city is defined as a city where 25% or more of children live below the poverty threshold. The four core cities are Central Falls, Pawtucket, Providence, and Woonsocket.

Data source 2005-2012 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis

Emergency Department Visits and Costs

In 2012, there were 6,201 ED visits in Rhode Island for which asthma was the principal diagnosis. Shown in Table 14 are data on average and total charges for asthma related ED visits by age, sex, race/ethnicity, and payer type. Table 14 includes ED visits that discharged home and visits that resulted in an inpatient hospitalization. For ED visits that result in an inpatient hospitalization, only charges that were accrued while in the ED are included in Table 14. Charges accrued during the inpatient hospitalization are not included in Table 14.



TABLE 14. NUMBER OF ASTHMA¹ EMERGENCY DEPARTMENT VISITS, AVERAGE CHARGE PER ASTHMA ED VISIT, AND TOTAL ASTHMA ED CHARGES BY PATIENT CHARACTERISTICS, RHODE ISLAND EMERGENCY DEPARTMENT DATA, 2012

CHARACTERISTIC		ED VISITS	AVERAGE CHARGE	TOTAL CHARGES
All events		6,201	\$1,500	\$9,302,807
Children 0 - 17		1,996	\$1,632	\$3,258,739
Age	0-4	752	\$1,725	\$1,297,359
	5-9	694	\$1,646	\$1,142,797
	10-14	378	\$1,539	\$582,035
	15-17	172	\$1,375	\$236,548
Sex	Male	1,246	\$1,676	\$2,088,595
	Female	750	\$1,560	\$1,170,144
Race	Hispanic	670	\$1,652	\$1,107,467
	Black	333	\$1,732	\$576,887
	White	862	\$1,576	\$1,359,280
	Other	131	\$1,642	\$215,105
Payer	Ritecare/Medicaid	1,216	\$1,592	\$1,936,221
	Self pay	109	\$1,637	\$178,445
	Commercial	663	\$1,711	\$1,135,052
	Unknown	-	-	-
Adults total		4,205	\$1,437	\$6,044,068
Age	18-44	2,313	\$1,292	\$2,990,267
	45-64	1,388	\$1,538	\$2,136,005
	65+	504	\$2,356	\$1,187,600
Sex	Male	1,450	\$1,355	\$1,965,809
	Female	2,755	\$1,480	\$4,078,259
Race	Hispanic	733	\$1,502	\$1,101,226
	Black	563	\$1,472	\$828,810
	White	2,757	\$1,420	\$3,917,077
	Other	152	\$1,295	\$196,955
Payer	Medicaid	1,080	\$1,370	\$1,479,772
	Self-payer	1,065	\$1,364	\$1,453,132
	Medicare	993	\$1,694	\$1,682,745
	Commercial	1,029	\$1,337	\$1,375,926
	Unknown	-	-	-

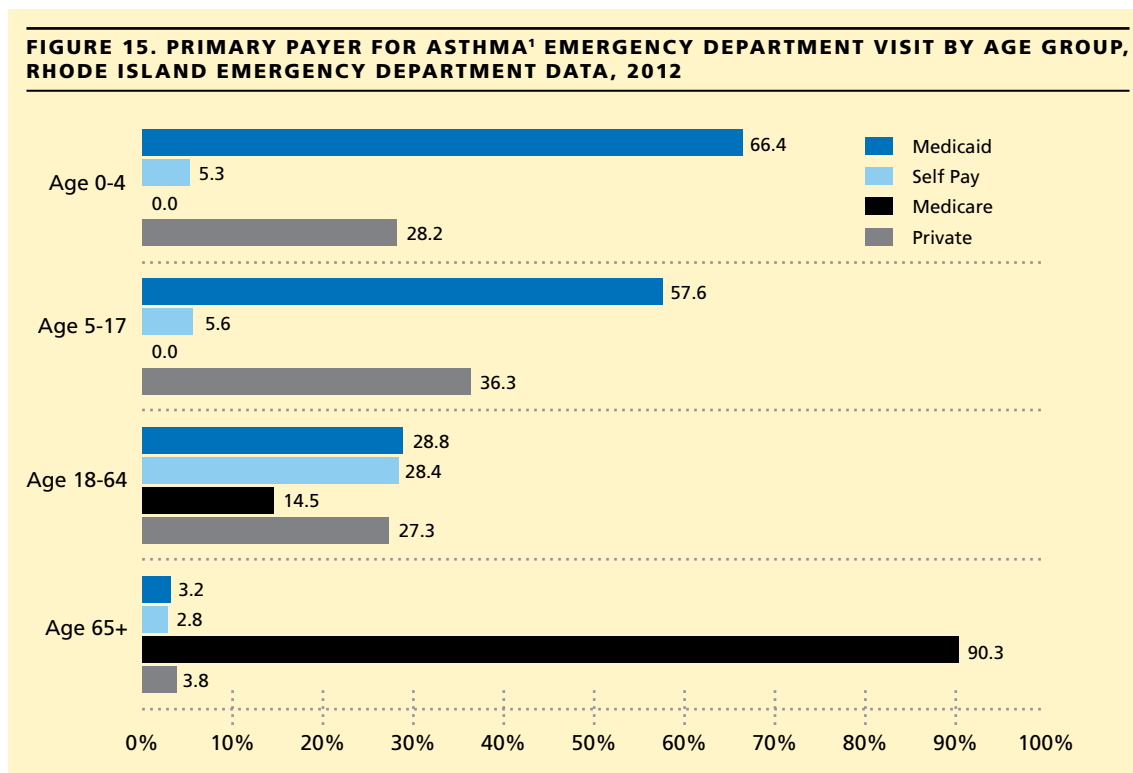
- = Data suppressed due to low numbers. Not enough cases for analysis.

¹ Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

Data source 2005-2012 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis

Asthma Emergency Department Visits by Payer

Figure 15 shows the primary payer for asthma ED visits by age group. In 2012, Medicaid insured 66.4% of children ages zero to four years with an asthma ED visit. Medicare was billed for 90.3% of asthma ED visits for patients aged 65 years or older.



¹ Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)
 Data source 2005-2012 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis



DEATHS DUE TO ASTHMA

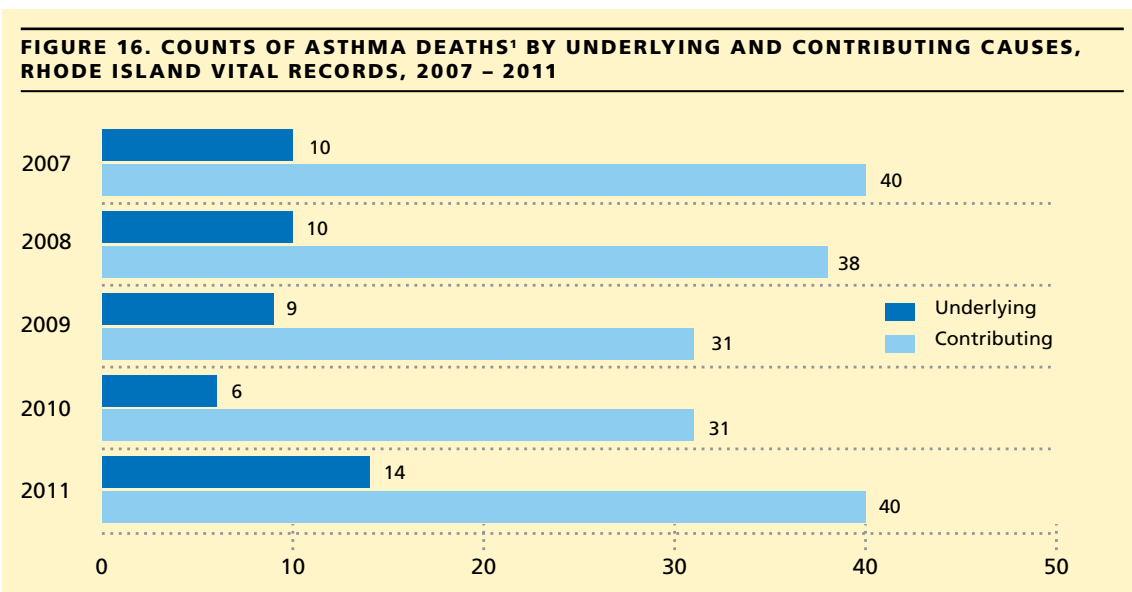
Asthma-related deaths represent the most extreme consequence of asthma. Many deaths from asthma could be prevented with proper treatment, quality health care, consistent self-management, and a reduction in environmental triggers known to increase the risk of developing asthma and having more severe asthma once the disease develops.

Defining an Asthma Death

Two mutually exclusive groups of asthma deaths were established: 1) deaths where the underlying, or immediate, cause of death was asthma and 2) deaths where a disease and/or condition other than asthma was listed as the underlying cause of death and asthma was listed as one of the contributing causes. The underlying cause of death is the first listed cause of death on the death certificate. Any causes of death listed after the underlying cause of death is considered a contributing cause of death. When asthma is identified as the contributing cause of death, the underlying cause of death is not restricted to respiratory disease.

The coding for asthma deaths is different from the coding used to identify a hospitalization for asthma. Deaths are coded by ICD-10 codes. Asthma codes as defined by ICD-10 are J45 and J46.

Between 2007 and 2012, there was an average of 10 deaths per year in Rhode Island for which asthma was the underlying cause (Range: 6 to 14 deaths). There was an average of 36 deaths per year where asthma was listed as a contributing cause of death (Range: 31 to 40). See Figure 16.



¹ Asthma coded as a cause of death (ICD-10 codes J45-J46)

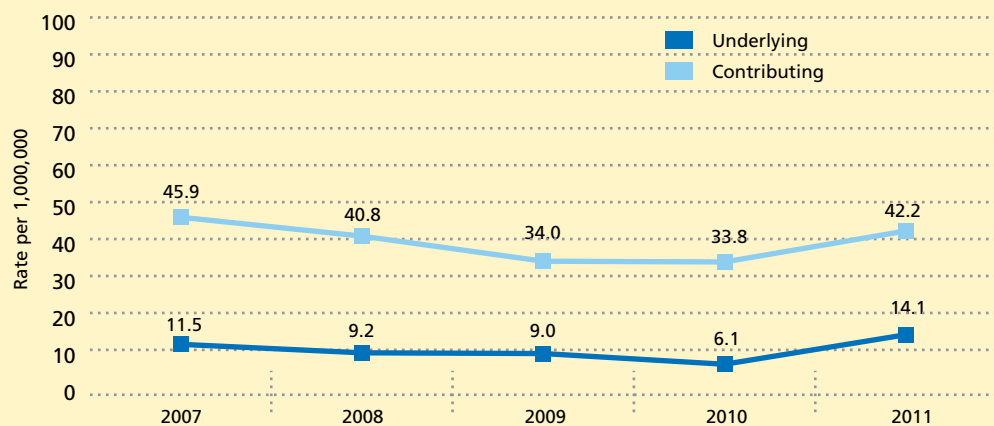
Data source: 2007-2011 Rhode Island Vital Record Death Data, Rhode Island Department of Health, Center for Health Data and Analysis



Trends in Asthma Deaths

Figure 17 illustrates trends in the age-adjusted mortality rate for which asthma was the underlying or contributing cause of death. Data are shown for adults aged 18 or older. During this period the number of children that died of asthma as the underlying or contributing cause of death was very low. The average mortality rate between 2007 and 2011 where asthma was the underlying cause of death was 10.6 deaths per million Rhode Island adults aged 18 and older. The average mortality rate between 2007 and 2011 where asthma was the contributing cause of death was 42.21 deaths per one million Rhode Island residents aged 18 and older. Age-adjusted mortality rates for asthma are based on a small number of events and should be interpreted with caution.

FIGURE 17. AGE-ADJUSTED¹ ADULT ASTHMA MORTALITY RATES² BY UNDERLYING AND CONTRIBUTING CAUSE OF DEATH³, RHODE ISLAND VITAL RECORDS, 2007 TO 2011



1 Age-adjusted to the year 2000 US standard population

2 All rates are per 1,000,000 Rhode Island residents ages 18+. Deaths from asthma in children were excluded from the calculations of the age-adjusted rate because the number of deaths in any year were less than 5.

3 Asthma coded as a cause of death (ICD-10 codes J45-J46)

Data source: 2007-2011 Rhode Island Vital Record Death Data, Rhode Island Department of Health, Center for Health Data and Analysis

Disparities in Asthma Deaths

TABLE 15. DEATHS ATTRIBUTABLE TO ASTHMA AS THE UNDERLYING (PRINCIPAL) CAUSE OF DEATH¹ AND OVERALL AGE-ADJUSTED² ASTHMA MORTALITY RATES³ BY AGE GROUP, RHODE ISLAND VITAL RECORDS, 2007 TO 2011

COUNTS OF ASTHMA UNDERLYING CAUSE OF DEATH		2007	2008	2009	2010	2011	Average	Average Age Specific Rate per Million
Age	0-17	0	2	1	1	1	1	4.5
	18-44	1	1	1	2	1	1.2	3.1
	45-64	3	2	3	0	6	2.8	9.7
	65-84	3	1	1	2	4	2.2	17.6
	85+	3	4	3	1	2	2.6	100.7
AGE ADJUSTED ASTHMA MORTALITY RATE IN RHODE ISLAND RESIDENTS AGES 18 AND OLDER								
Overall		11.5	9.2	9.0	6.1	14.1	10.0	-

Data are statistically unreliable when the number of deaths in a specific age group in a year is less than 5.

1 Asthma listed as the underlying cause of death (ICD-10 codes J45 - J46)

2 Standard 2000 US population used for direct age-adjustment

3 All rates are per 1,000,000 Rhode Island residents

Data source: 2007-2011 Rhode Island Vital Record Death Data, Rhode Island Department of Health, Center for Health Data and Analysis

TABLE 16. DEATHS ATTRIBUTABLE TO ASTHMA AS THE CONTRIBUTING CAUSE OF DEATH¹ AND OVERALL AGE-ADJUSTED² ASTHMA MORTALITY RATES³ BY AGE GROUP, RHODE ISLAND VITAL RECORDS, 2007 TO 2011

COUNTS OF ASTHMA CONTRIBUTING CAUSE OF DEATH		2007	2008	2009	2010	2011	Average	Average Age Specific Rate per Million
Age	0-17	0	2	1	1	2	1.2	5.4
	18-44	2	2	2	4	4	2.8	7.2
	45-64	8	8	4	8	11	7.8	27.0
	65-84	19	12	9	12	12	12.8	102.6
	85+	11	14	15	6	11	11.4	441.5
AGE ADJUSTED ASTHMA MORTALITY RATE IN RHODE ISLAND RESIDENTS AGES 18 AND OLDER								
Overall		45.9	40.8	34.0	33.8	42.2	39.3	-

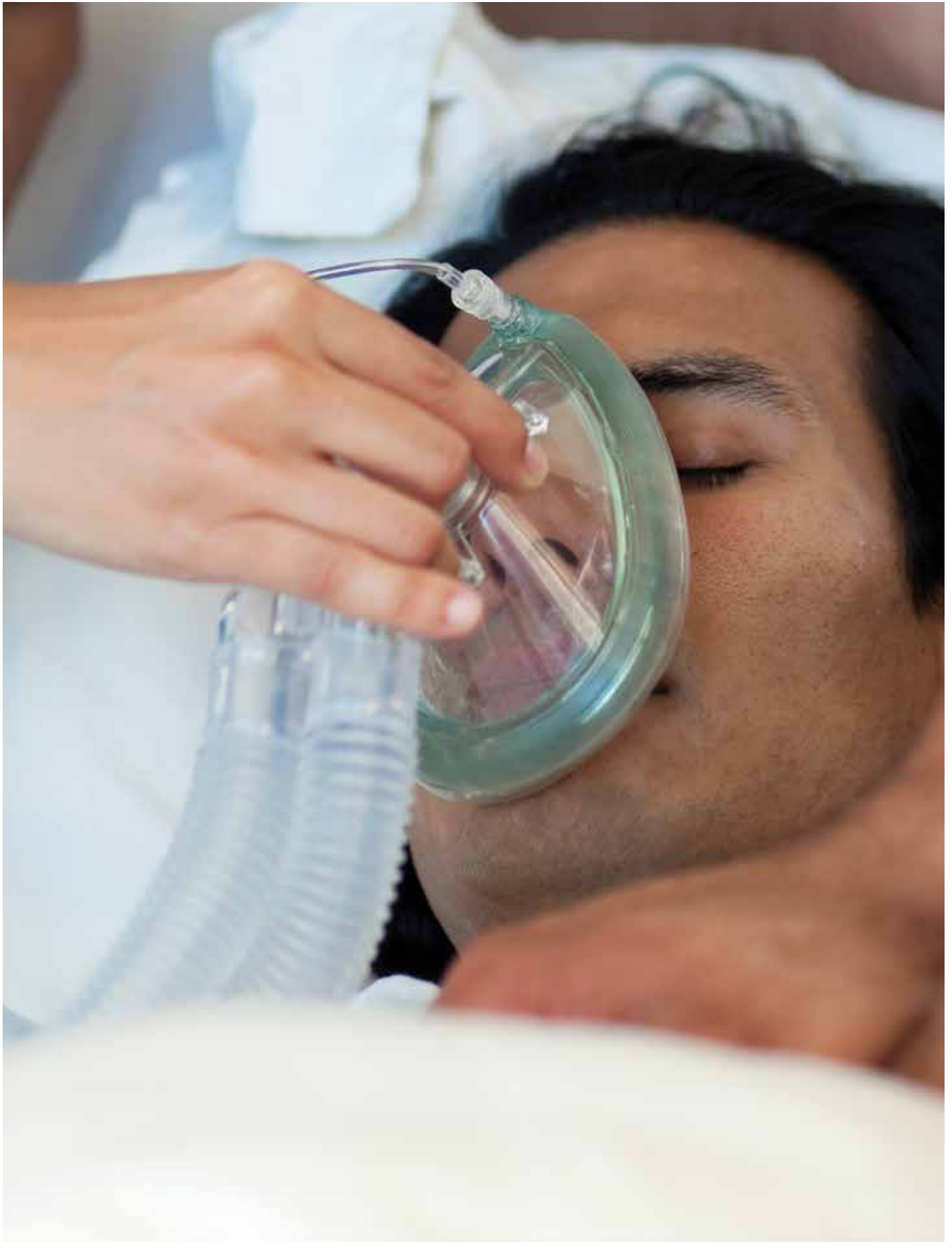
Data are statistically unreliable when the number of deaths in a specific age group in a year is less than 5.

1 Asthma listed as the underlying cause of death (ICD-10 codes J45 - J46)

2 Standard 2000 US population used for direct age-adjustment

3 All rates are per 1,000,000 Rhode Island residents

Data source: 2007-2011 Rhode Island Vital Record Death Data, Rhode Island Department of Health, Center for Health Data and Analysis



ADDITIONAL ASTHMA DATA SOURCES

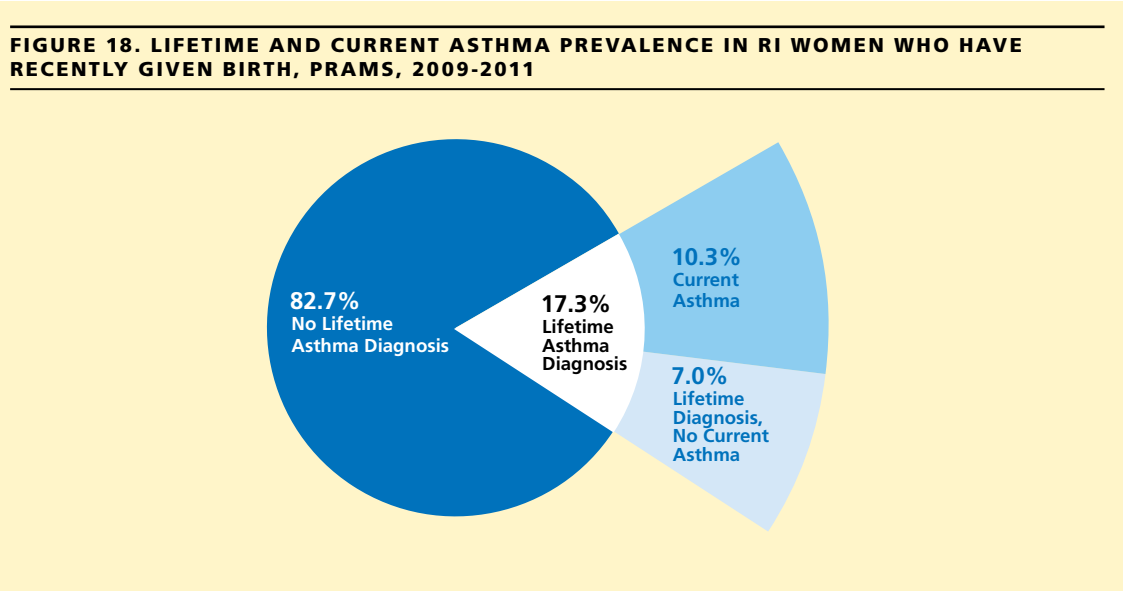
There are additional data sources that can provide supplemental information about asthma in Rhode Island. The following data sets provide a glimpse at asthma prevalence in recent mothers, respiratory disorders in toddlers, asthma claims in government-funded programs, and environmental triggers of asthma.

Pregnancy Risk Assessment Monitoring System

The CDC’s Pregnancy Risk Assessment Monitoring System (PRAMS) is a population-based confidential survey. RI is one of 41 states currently participating in PRAMS. Women who have recently delivered a live birth participating in the survey are asked about lifetime and current asthma prevalence.

Lifetime asthma prevalence	Have you ever been told by a doctor, nurse, or other health professional that you have asthma?
Current asthma prevalence	Do you still have asthma?

In 2009-2011, 17.3% of women who had recently given birth had a lifetime asthma diagnosis and 10.3% reported currently having asthma.



Toddler Wellness Overview Survey

The RI Toddler Wellness Overview Survey (TWOS) is a follow-up survey for PRAMS participants. The survey is optional and is conducted when the child turns two years of age. TWOS asks “During the last 12 months, has a doctor or other healthcare professional said that your child has asthma, bronchitis, wheezing, or shortness of breath?” Due to low numbers of respondents, 2009 and 2010 survey responses were combined. In the two year combined period, 12.5% of respondents reported they have been told by a healthcare professional that their child had asthma, bronchitis, wheezing, or shortness of breath.

Rhode Island Government-Funded Programs

Rhode Island’s Medicaid managed care plans are known as Rite Care. Families on RI Works Program, pregnant women, children, and some parents or caretakers of children may be eligible for Rite Care if the income requirements are met. Income requirements for pregnant women and children are a family income of less than 250% of the Federal Poverty Level, and 133% of the Federal Poverty Level for parents or caregivers of children on Rite Care. UnitedHealthcare of New England and Neighborhood Health Plan of Rhode Island participate in Rite Care. Rhody Health Partners (RHP) is a health care program for adults who are 21 years old or older and have RI Medical Assistance. UnitedHealthcare of New England and Neighborhood Health Plan of Rhode Island participate in RHP.

Table 18 shows asthma claims rates per 10,000 enrollees in Rite Care and RHP.

TABLE 18. ASTHMA CLAIM¹ RATES² TO RITE CARE AND RHODY HEALTH PARTNERS IN STATE FISCAL YEAR 2013³ BY AGE.

		0 – 4 YEARS	5 – 17 YEARS	18 – 64 YEARS	65+ YEARS	ALL AGES AVERAGE
Rite Care	Outpatient	1,069	1,214	603	-	939
	Emergency Department	134	114	77	-	103
	Inpatient Hospitalization	19	12	-	-	12
Rhody Health Partners	Outpatient			1,504	343	1,408
	Emergency Department			979	-	908
	Inpatient Hospitalization			76	-	71

- = Data suppressed due to low numbers. Not enough cases for analysis.

1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00-493.92)

2 All rates are per 10,000 enrollees.

3 State Fiscal Year 2013 is July 1, 2012 through June 30, 2013.

Data source: Rhode Island Department of Human Services.



Air Quality

Rhode Island Department of Environmental Management (RI DEM) and the Rhode Island Department of Health Air Pollution Laboratory monitor ambient air quality at multiple locations in RI. Ozone (O₃) and particulate matter (PM) levels are of particular concern for those with asthma.

PM₁₀ (particulate matter where the particles have diameters of 10 micrometers or less) levels have been monitored in RI since 1985. The National Ambient Air Quality Standard (NAAQS) for PM₁₀ is 150 µg/m³ as a 24-hour average, which has never been exceeded since monitoring began. In 2011, the highest observed 24-hour average PM₁₀ concentration was 38 µg/m³. The annual average PM₁₀ concentrations have seen a decreasing trend since 1985.

PM_{2.5} (particulate matter where the particles have diameters of 2.5 micrometers or less) levels have been monitored in RI since 1999. NAAQS for PM_{2.5} are 35 µg/m³ in an average 24-hour period.⁹ The PM_{2.5} levels have never exceeded the NAAQS standard since monitoring began. A slight increase in the annual average level was noted in 2011 when compared to 2010, however the general trend since 1999 has been downward.¹⁰

The NAAQS for Ozone is 0.075 ppm average in an 8-hour period.⁹ The number of days that exceed this standard in a given year is weather dependent. In a 14-year monitoring period, the highest number of days exceeding this standard was noted in 2002 with 33 days, and the lowest number of days exceeding this standard was noted in 2009 with 1 day.¹⁰

Claims Data Reports

The Rhode Island Asthma Control Program (RIACP) received claims data from Blue Cross Blue Shield of Rhode Island, Neighborhood Health Plan of Rhode Island, and United Healthcare of New England. The address level claims data was provided on children ages 2 to 17 years old with an asthma related healthcare claim and spanned the years 2010-2012.

A report using the claims data to understand the geography of asthma in Rhode Island was published in 2014. The report identified communities where children who have sought medical care for asthma are most prevalent, mapped areas where higher rates of children with asthma are seeking emergency department care or are hospitalized for asthma, and mapped the proximity of asthma incidence to some of the socioeconomic and physical determinants of health: poverty and housing. The report also examines rates of chronic absenteeism among public school students with asthma claims. This report can be found on the RIACP data page, or at the following URL.

<http://www.health.ri.gov/publications/databooks/2014AsthmaClaims.pdf>

The claims data were also used to inform school district summary reports by linking to Rhode Island Department of Education data. The reports were sent to each school district and detailed immunization reporting and coverage, lead exposure, and asthma claims rates within each school in the district. A statewide summary report was also produced comparing overall rates within each district in the state. The reports were sent to the superintendents of Rhode Island school districts and to the heads of private schools. The district reports and the statewide summary can be found on the Healthy Schools webpage.



⁹United States Environmental Protection Agency, National Ambient Air Quality Standards. Available at: <http://www.epa.gov/air/criteria.html>. Last updated: December 14, 2012.

¹⁰Rhode Island Department of Environmental Management, 2011 Air Quality Summary State of Rhode Island. Available at: <http://www.dem.ri.gov/programs/benviron/air/pdf/aqds2011.pdf>

¹¹<http://www.health.ri.gov/for/schools/>



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