

The Burden of Asthma in Washington State

2013

Update



DOH 345-240 FEBRUARY 2013

The Burden of Asthma in Washington State

February 2013 Update



Mary C. Selecky
Secretary of Health

Allene Mares, RN, MPH
Assistant Secretary

Sue Grinnell, MPH
Director, Office of Healthy Communities

Anne Shields, RN, MHA
Manager, Practice Improvement Section

WRITTEN AND PREPARED BY:

Nguyet Tran, MPH
Surveillance and Evaluation Section

Lanae Aldrich
Asthma Program

Dennis McDermot, PhD
Surveillance and Evaluation Section

CONTRIBUTORS:

Department of Health:

Keith Zang, BSEH, AE-C
Asthma Program

Nancy Bernard, MPH
Environmental Health

Judy Bardin, ScD, MS, RN
Outdoor Air Quality

Anar Shah, MPH
Surveillance and Evaluation

Megan Mikkelsen, MPH
Surveillance and Evaluation Section

Paula Smith
Office of the Assistant Secretary

Michael Boysun, MPH
Surveillance and Evaluation Section

Partners:
Gary Palcisko
Air Quality Program, WA Department of Ecology

Riley Peters, PhD
Surveillance and Evaluation Section

Funding for this report was provided by the Washington State Department of Health and the United States Centers for Disease Control and Prevention (5U/59EH000513).

For people with disabilities, this document is available on request in other formats.
To submit a request, please call 1-800-525-0127 (TDD/TTY call 711)

For more information, contact the Asthma Unit
PO Box 47855, Olympia, WA 98504-7855
360-236-3851 www.doh.wa.gov



EXECUTIVE SUMMARY	iii
<hr/>	
INTRODUCTION	
What is asthma?	1
Costs of asthma	3
<hr/>	
WHO HAS ASTHMA?	
Overview	4
Adults with asthma	5
Children with asthma	10
Youth with asthma	12
<hr/>	
ASTHMA RISK FACTORS	
Overview	15
Smoking	16
Obesity	19
Environmental factors and triggers: Indoors	21
Environmental factors and triggers: Outdoors	23
<hr/>	
LIVING WITH ASTHMA	
Overview	24
Asthma management	25
Access to care and utilization	27
Quality of Life	29
<hr/>	
ASTHMA HOSPITALIZATION	
Overview	34
Asthma hospitalization data	35
<hr/>	
ASTHMA DEATHS	
Overview	38
Asthma death data	39
<hr/>	
CONCLUSION	41
<hr/>	
APPENDICES	
A: List of figures, tables, and maps	42
B: Figure and map data tables	44
C: Data source description	63
D: Technical notes	67
E: Definitions and glossary of terms	72
F: Citations	74

The Burden of Asthma in Washington State

2013 Update

The Burden of Asthma in Washington State is a data specific report with an intended audience of asthma professionals, including members of the Washington Asthma Initiative, health care providers, and public health professionals.

A Manageable Public Health Concern

Asthma is a chronic lung disease that affects more than 9 percent of Washington adults (ages 18 and older). Although death from asthma is uncommon, adult prevalence of current asthma in Washington continues to be higher than the United States average and identified by the Centers for Disease Control (CDC) as one of the highest in the nation. In addition, nearly 110,000 youth in Washington are estimated to have asthma.

Having asthma is associated with reduced quality of life, limited activities, and depression and suicidal thoughts among young people. People with asthma are more likely than people without asthma to report they had unmet healthcare needs due to costs and inability to pay.

Prevalence

- In 2010, more than 780,000 adults were estimated to have lifetime asthma, and over 490,000 were estimated as having current asthma.
- Almost 30 percent of people report having at least one night per month with sleep disturbances due to their asthma.
- About 80 percent of adults and 60 percent of youth had symptoms during the past month.
- About 74 percent of youth have asthma symptoms at least one day per month, with 1 in 8 experiencing daily symptoms.

Costs

- In 2010, hospitals charged about \$73 million for asthma related hospitalizations.
- \$4.8 million were charged to the patients themselves.
- Insurance providers, government sponsored programs, and charities were charged \$68.5 million.

- \$43.1 million were charged to Medicaid and Medicare.
- Work-related asthma is the most commonly diagnosed occupational lung disease in the US. In 2010, there were 42 (accepted, state fund) work-related asthma claims in Washington State, with total costs of about \$300,000.

Individual Factors Affecting Asthma

- Among young children, asthma prevalence is higher for boys than for girls; by middle school age these differences reverse so that by high school and in later years rates are higher for women than for men.

- Many people who develop asthma have allergies, particularly those with childhood onset of asthma.
- Youth who use marijuana or cigarettes are significantly more likely to have asthma symptoms than youth who do not.

Social Inequities

- American Indian/Alaskan Natives have higher prevalence of asthma than non-Hispanic whites, and both American Indians/Alaska Natives and African Americans have significantly higher rates of death due to asthma than non-Hispanic whites.

- People with low income and fewer years of school are more likely to have asthma.
- Asthma hospitalization rates are higher in urban areas than in rural areas.

Hospitalizations and Deaths

- About 75 people per year die from asthma.
- More than 100 people every week are hospitalized as a direct result of asthma.
- Deaths attributed to asthma have been declining since the mid-90s, most likely in response to successful clinical practice improvements.

Indoor and Outdoor Environment

- There is sufficient evidence for a causal relationship between exposure to dust mites and development or exacerbation of asthma – most houses contain habitats for dust mite growth such as mattresses, pillows, bedding, stuffed animals.
- A substantial number of people with asthma have “triggers” in their homes that they may not realize make their asthma worse – carpet, pets, cockroaches, water damage, secondhand smoke and mold.
- Research has shown a number of indoor exposures, such as dust mite and cockroach allergens, secondhand tobacco smoke, dampness, and some chemicals may contribute to the development of asthma.
- Poor outdoor air quality caused by mobile vehicle exhaust, woodstoves, outdoor burning, and industrial emissions can affect asthma.

Work and School

- The proportion of adult-onset asthma that can be attributed to workplace exposures has been estimated to be 20%.
- In 2010, 22 percent of Washington adults with asthma missed work, or could not do normal activities, for a total of 4.3 million person-days of lost productivity. Similarly, 25 percent of Washington 10th grade youth with asthma missed at least one day of school in 2010, 5 percent missed 5 or more days.

Asthma Management

- About 35 percent of adults with asthma report not visiting the doctor for routine checkups.
- Only one-third of youth with asthma reported having a written asthma plan to help them control their medications and exposures.
- About two-thirds of adults with asthma who smoke were advised to quit by their healthcare provider during at least one visit within the past year.

- About 53,000 adults with asthma make at least one emergency department visit per year.
- Hospitalization rates are highest for children under age 5, but death rates are highest for people older than 65.

- Air pollution exposure, including from fine particulate matter, nitrogen oxides, carbon monoxide, sulfur dioxide, diesel exhaust and wood smoke makes asthma worse.
- Although Washington’s air quality is generally good and has improved substantially over time, there are areas of the state where air pollution is of concern. Higher rates of hospitalization in urban areas may be related to asthma exacerbation from air pollution.
- In 2010, exposure to secondhand smoke ranged from 24 percent among grade 6 students to 41 percent among grade 12 students.
- Wood burning and cooking with gas can exacerbate asthma.

- Poor air quality at school exacerbates asthma and is associated with decreased student attendance. Air in or around schools may be affected by management of ventilation and filtration systems, cleaning practices, “idling” by school bus engines or others waiting to pick up students.
- Youth with more severe asthma symptoms are less likely to have high academic achievement than youth with fewer symptoms or those without asthma.

- About half of youth in Washington report using a rescue inhaler at least once per week in the past month, with 10 percent of youth using it every day.
- Adults with asthma are more likely than adults without asthma to have had seasonal flu and pneumococcal vaccinations, a recommended component of healthcare for not only asthma patients but also for all adults in general.

What is asthma?¹

Asthma is a chronic inflammatory disorder of the airways associated with airway hyperresponsiveness, airflow limitation and respiratory symptoms. The American Thoracic Society definition for asthma is the most widely cited to describe asthma. They define asthma as a “common but complex disease of the pulmonary airways (trachea, bronchi, and bronchioles) that is characterized by difficulties getting air in and out of the lungs (variable airflow obstruction), environmental triggers causing breathlessness (airway hyperresponsiveness), and cellular inflammation².” One or more of the following characteristics need to be present to assign the diagnosis of asthma:

Airway Obstruction

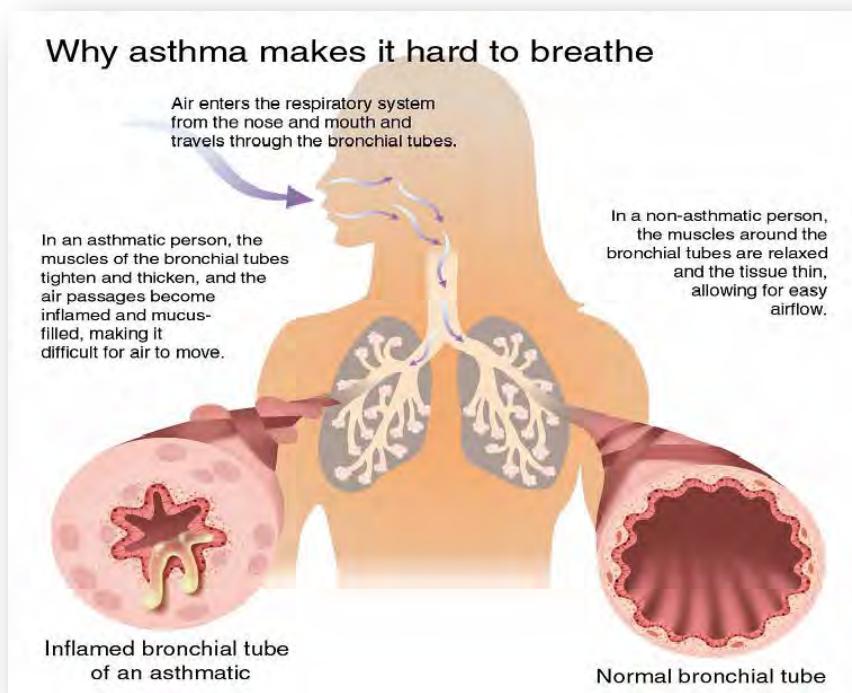
Narrowing that is reversible (but not completely in some patients) either spontaneously or with treatment.

Airway inflammation

Thickening of all layers of the bronchial tube walls.

Bronchial Hyperresponsiveness

Bronchial hyper-responsiveness is an abnormal tendency of the bronchi to contract following the exposure to a variety of stimuli, including allergens, cold air, exercise, and non-physiological stimuli.



*Printed with permission from the American Academy of Allergy, Asthma & Immunology.
Copyright American Academy of Allergy, Asthma & Immunology, all rights reserved*

The key indicators for asthma diagnosis have been identified by the National Asthma Education and Prevention Program expert panel. However, by themselves, they are not a diagnosis. If multiple indicators are present, the probability of asthma increases. The key indicators of asthma are:

1. Wheezing (especially in children).
2. History of cough (especially at night), recurrent wheeze, recurrent shortness of breath, difficult, labored breathing, or recurrent chest tightness.
3. Symptoms that occur or worsen in the presence of exercise, viral infection, animals with fur or feathers, house-dust mites, mold, smoke, pollen, changes in weather, strong emotional expression, airborne chemicals/dusts, and/or menses.
4. Symptoms that occur or worsen at night, awakening the patient.

Bronchial asthma in the untreated state is recognized by recurrent episodes of airflow limitation usually reversible spontaneously or with appropriate treatment. Symptoms of airway limitations can be breathlessness, wheezing, chest tightness and/or cough.

There are four forms of airflow limitation related to inflammation in the airways³:

Airway Wall Swelling

In untreated asthma, the inner lining of bronchi and bronchioles becomes inflamed and thickened, causing narrowing of the central air passage.

Acute Bronchoconstriction

Bronchoconstriction is caused by contraction of the smooth muscle that surrounds the airways.

Bronchoconstriction, or bronchospasm, is most likely to occur in the presence of intense inflammation. Such bronchospasm causes the openings in the air passages to narrow even more.

Chronic Mucus Plug Formation

The overproduction of mucus in the inflamed airway causes plugs. The plugs are comprised of mucus secretion, exuded serum proteins and cell debris. This aggravates the airflow limitation caused by the other processes described.

Airway Remodeling

Airway remodeling refers to an alteration in the composition of the airway wall. It occurs in some patients, usually those with longstanding asthma. Normal components are replaced by less functional substances, similar to scar tissue replacing normal tissue. This form of airway obstruction may be persistent and may not respond to treatment.

Asthma can range from being an intermittent nuisance triggered by specific factors, such as allergen exposure or exercise, to being a severe, progressive, and occasionally fatal disease without apparent external cause. This diversity has led to a growing appreciation that asthma, as currently defined, probably is not a specific disease. Asthma is a syndrome with multiple causes leading to a common clinical presentation involving reversible airway obstruction.

We know that family history contributes to susceptibility, but in most cases we don't know what causes asthma to develop, and we don't know how to cure asthma. People can control their asthma by knowing the warning signs of an attack, avoiding things that trigger an attack and following the advice and prescriptions of their doctor. When asthma is controlled, people do not have symptoms like wheezing or coughing, they sleep better, don't miss work or school, and can take part in physical activities.⁴

Nationally

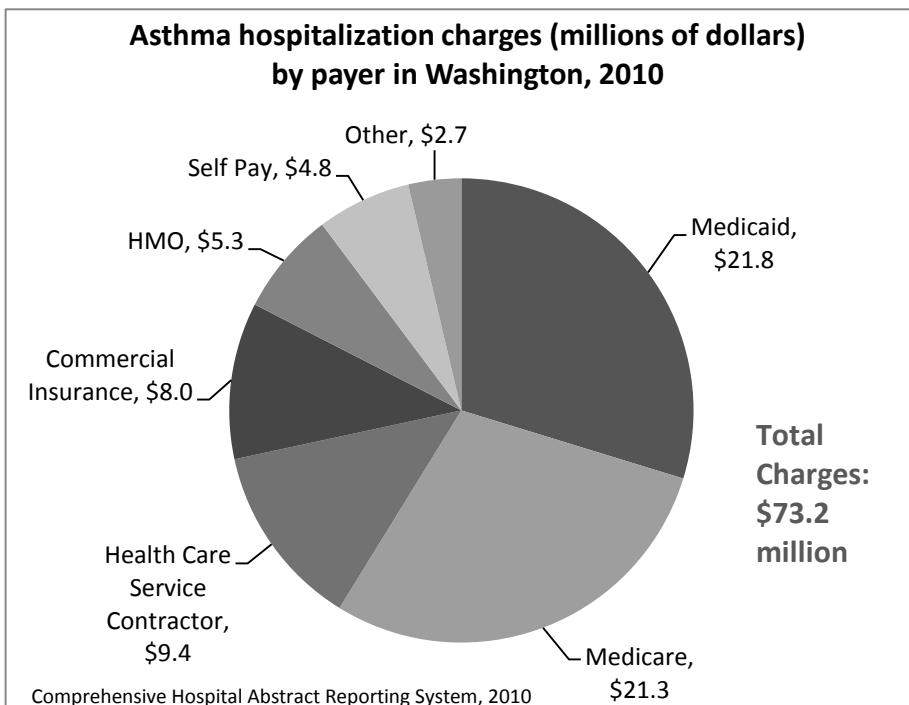
In 2007, the estimated national cost of asthma in the United States was \$56 billion (2009 dollars). This includes medical expenses (\$50.1 billion), loss of productivity due to missed school or work days (\$3.8 billion), and premature death (\$2.1 billion).⁵

Washington State

In 2010, 57,000 Washington adults with asthma visited the emergency room (ER) at least once, accounting for approximately 164,000 ER visits.⁶ ER visits due to asthma are driven by a small fraction of asthma patients with very poorly controlled asthma; public funds pay for about 60 percent of Washington's asthma hospitalization costs.⁷

In 2010, 22 percent of Washington adults with asthma missed work, or could not do normal activities, for a total of 4.3 million person-days of lost productivity.⁶ Similarly, 25 percent of Washington 10th grade youth with asthma missed at least one day of school in 2010, 5 percent missed 5 or more days.⁸

Figure 1. Asthma hospitalization charges in Washington, 2010

**KEY FINDINGS**

- In 2010, hospitals charged about \$73 million for asthma related hospitalizations [Fig. 1].
- \$4.8 million were charged to the patients themselves [Fig. 1].
- \$43.1 million were charged to Medicaid and Medicare [Fig. 1].

The Washington State Department of Health gathers data on Washingtonians' health and risk behaviors through multiple sources. The Asthma Program compiled data on asthma-related indicators and this report summarizes the surveillance findings using the most recent data available. We generally report the prevalence of asthma, defined as the percentage of people who have the condition at a single point in time.

Adult asthma prevalence is monitored by using the Behavioral Risk Factor Surveillance System (BRFSS), a national telephone survey sponsored by the Centers for Disease Control and Prevention (CDC). The BRFSS survey uses the following questions to define asthma for adults:

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

To assess asthma prevalence in Washington children, two sources of data are used. The first is the BRFSS survey by adult proxy (that is, having an adult answer for the child). The BRFSS by adult proxy survey uses the following questions to define asthma for children:

- Have you ever been told by a doctor, nurse, or other health professional ever said that the child has asthma?
- Does the child still have asthma?



The other source of data for asthma prevalence in children is the Healthy Youth Survey (HYS), a school-based questionnaire given to youth in grades 6, 8, 10, and 12. The HYS is sponsored by multiple agencies in Washington State. Its questionnaire uses the following questions to define asthma in youth:

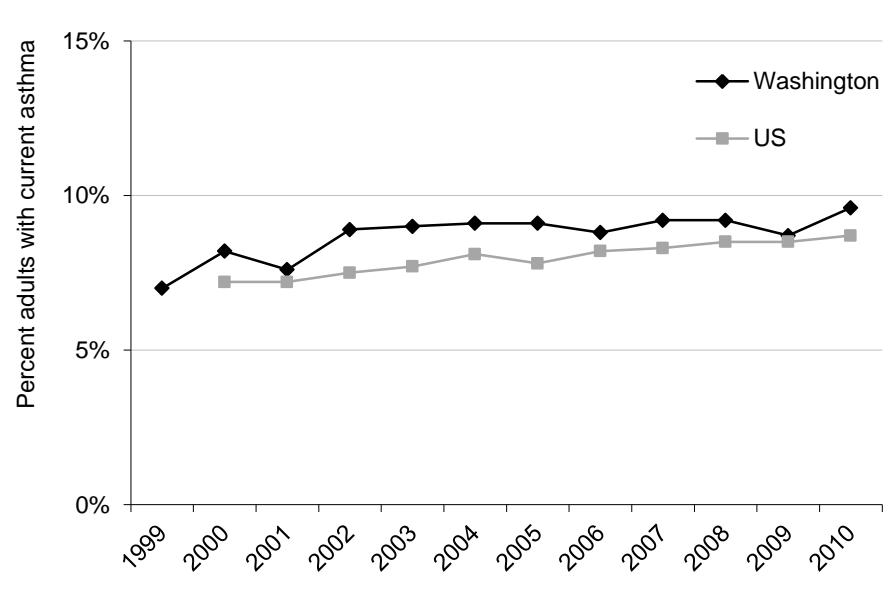
- Have you ever been told by a doctor or nurse that you have asthma?
- Do you still have asthma?

These questions create the two definitions of asthma used to understand the scope of the disease in Washington:

1. Lifetime asthma is when an adult or child has ever been told by a doctor, nurse, or other health professional they have asthma.
2. Current asthma is when the adult or child has ever been told they have asthma and they still have asthma at the time they responded to the survey.

For most of the analyses presented in this report, current asthma is used to describe the burden of asthma in Washington. There are many overlapping individual and environmental influences that contribute to asthma. Any reference to differences between groups implies that the differences are statistically detectable unless otherwise stated.

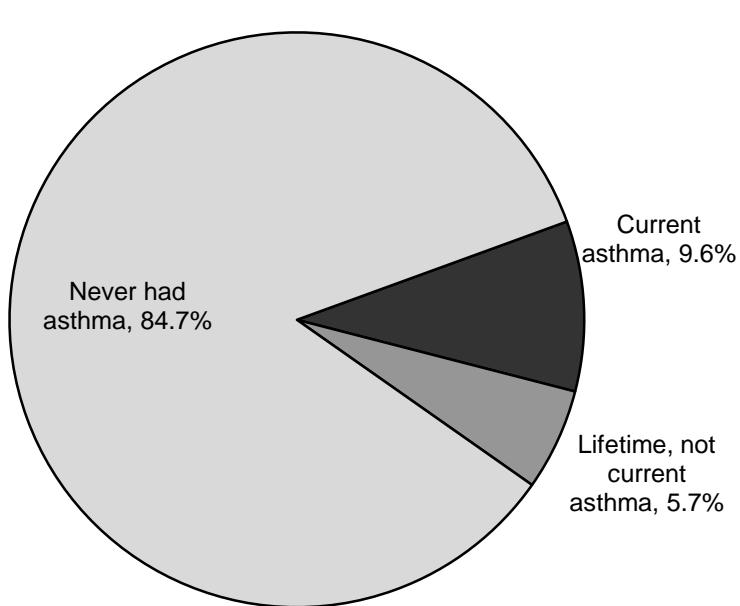
Figure 2. Adults with current asthma: Washington and U.S., 1999-2010



Washington Behavioral Risk Factor Surveillance System, 1999-2010

National data from the Behavioral Risk Factor Surveillance System, estimates exclude territories
Age-standardized

Figure 3. Adults with asthma, 2010



Washington Behavioral Risk Factor Surveillance System, 2010

KEY FINDINGS

- Washington's prevalence of current asthma in 2010 (9.6 percent) was higher than the national prevalence of 8.7 percent [Fig. 2].
- For the past decade, the percentage of Washington residents with asthma has been slowly trending upward. Washington asthma rates have increased from 7 percent to 9.6 percent since 1999. The U.S. adult asthma rates have also increased steadily, from 7.2 percent in 2000 to 8.7 percent in 2010.
- More than one in seven Washington adults (15.3 percent) have been told by a health professional at some point during their lifetime that they have asthma [Fig. 3]. Nationally, about 13 percent of adults had ever been told they had asthma.⁹
- Most adult Washingtonians who currently have asthma were diagnosed as adults (55 percent).⁶
- Based on 2010 data, more than 780,000 Washington adults were estimated as ever having asthma (lifetime) and over 490,000 were estimated to have current asthma.¹⁰

Figure 4. Adults with current asthma by age and sex, 2008-2010

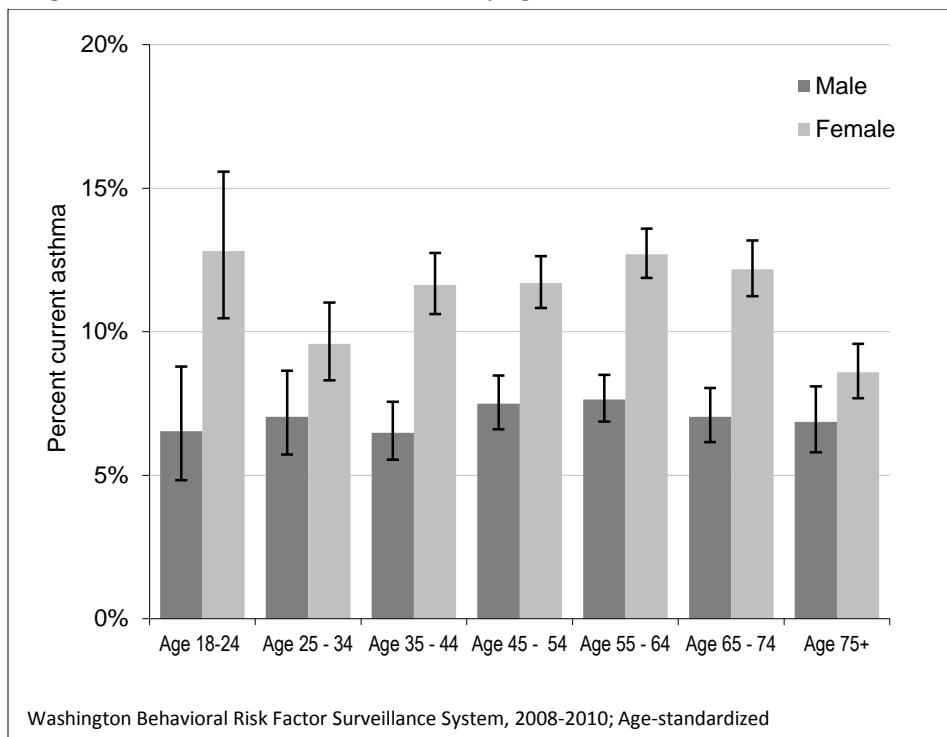
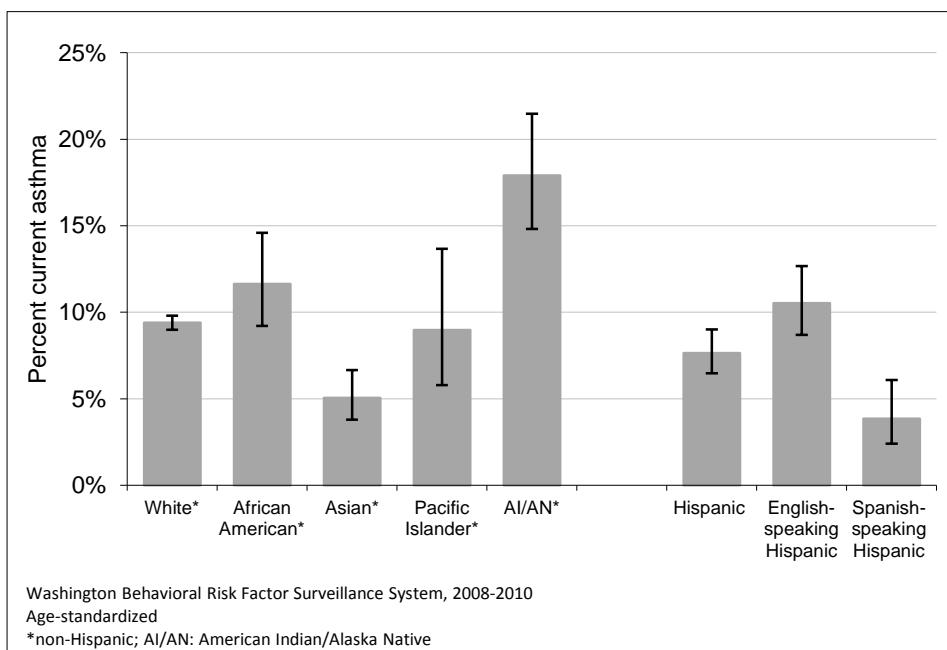


Figure 5. Adults with current asthma by race and Hispanic ethnicity, 2008-2010



KEY FINDINGS

- Overall, adult females are more likely to have asthma than adult males. This is also true across all adult age groups [Fig. 4].
- This reflects similar adult gender differences in asthma prevalence seen in national data¹¹ and in other states¹². Reasons for these gender differences are not completely understood. Studies indicate sex hormones, differences in airway size and responsiveness, obesity, or socio-economic differences could all be contributory factors.^{13, 14, 15, 16}
- Non-Hispanic American Indian and Alaskan Native (18 percent) persons report higher asthma rates than other racial/ethnic groups. Persons of Asian (5 percent) or Hispanic (any race, 8 percent) origin report lower asthma rates than other racial/ethnic groups, except Pacific Islander [Fig. 5]. These patterns are consistent with national data.¹¹
- Hispanic respondents who answer in Spanish are likely to be less assimilated into mainstream American culture than those who answer in English. Data show that Spanish-speaking Hispanics (4 percent) were less likely than English-speaking Hispanics (11 percent) to report having asthma [Fig 5]. English-speaking Hispanics were similar to non-Hispanics in reported current asthma.

Figure 6. Adults with current asthma by sexual orientation, 2008-2010

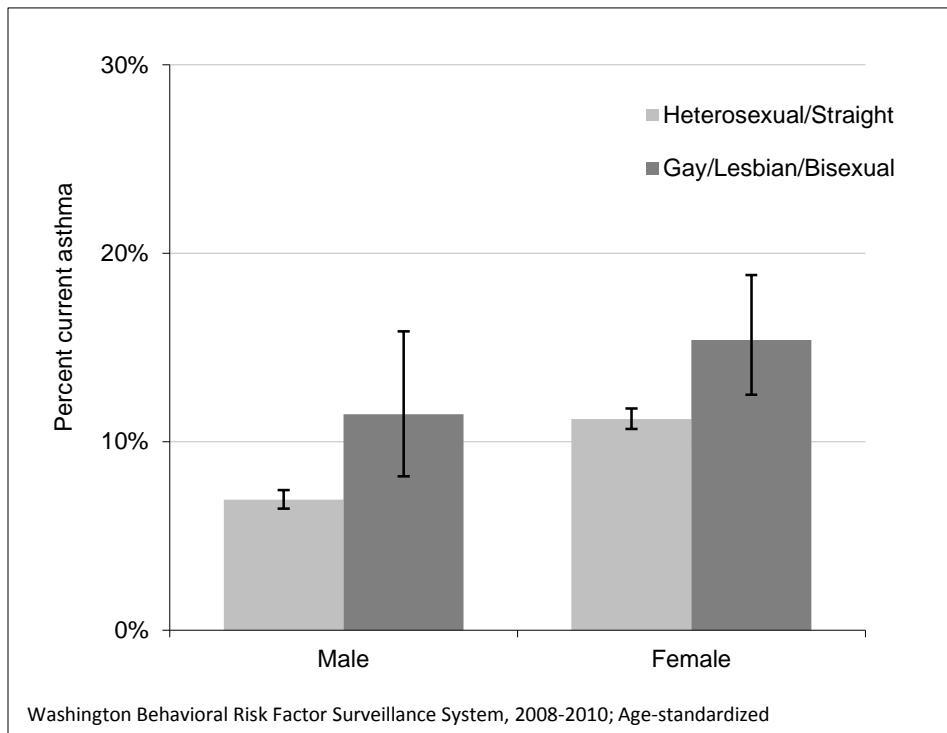
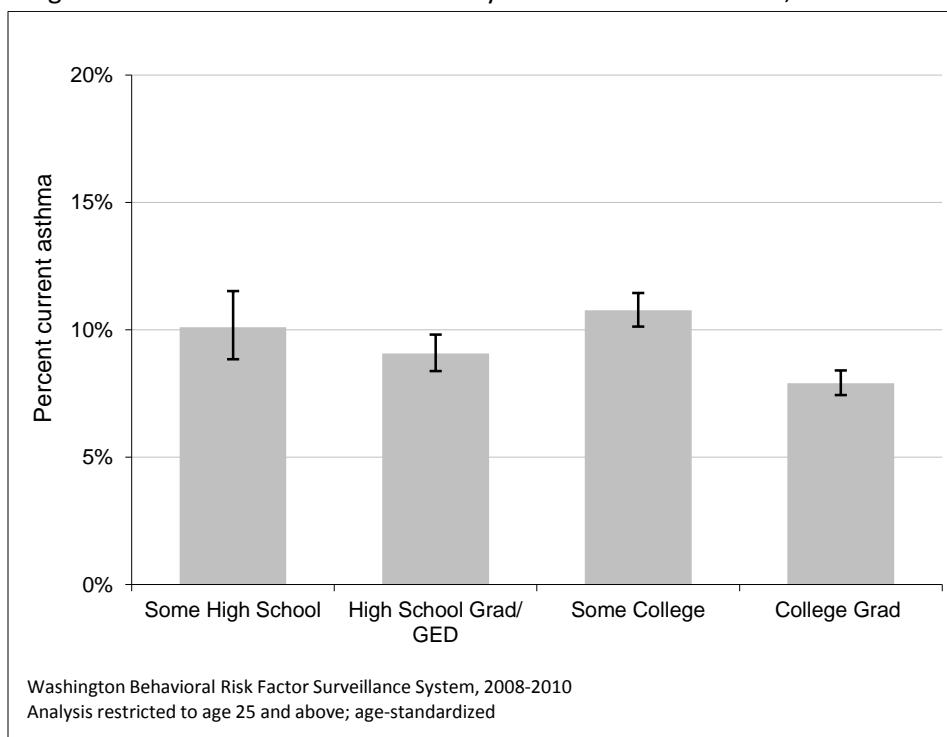


Figure 7. Adults with current asthma by educational attainment, 2008-2010



KEY FINDINGS

- Gay and bisexual men, as well as lesbian and bisexual women were combined for comparison to their heterosexual counterparts. Gay/lesbian/bisexual persons report higher rates of asthma than heterosexual persons [Fig. 6].
- Those in same-sex relationships may be at higher risk for asthma due to risk factors such as higher rates of smoking and minority stress.¹⁷ Among lesbian persons, another risk factor is a higher rate of obesity than the general population.¹⁸ In Washington, about 26.6 percent of gay/lesbian/bisexual persons report that they smoke. This is 75 percent higher than the overall Washington population.⁹
- The socioeconomic status (SES) of people as well as where they live and work strongly influence their health.¹⁹ Household income and educational attainment are used as indicators of socioeconomic status.
- Adults 25 and older who have completed four years of college were less likely to report current asthma than people with less education [Fig. 7].

Figure 8. Adults with current asthma by annual household income, 2008-2010

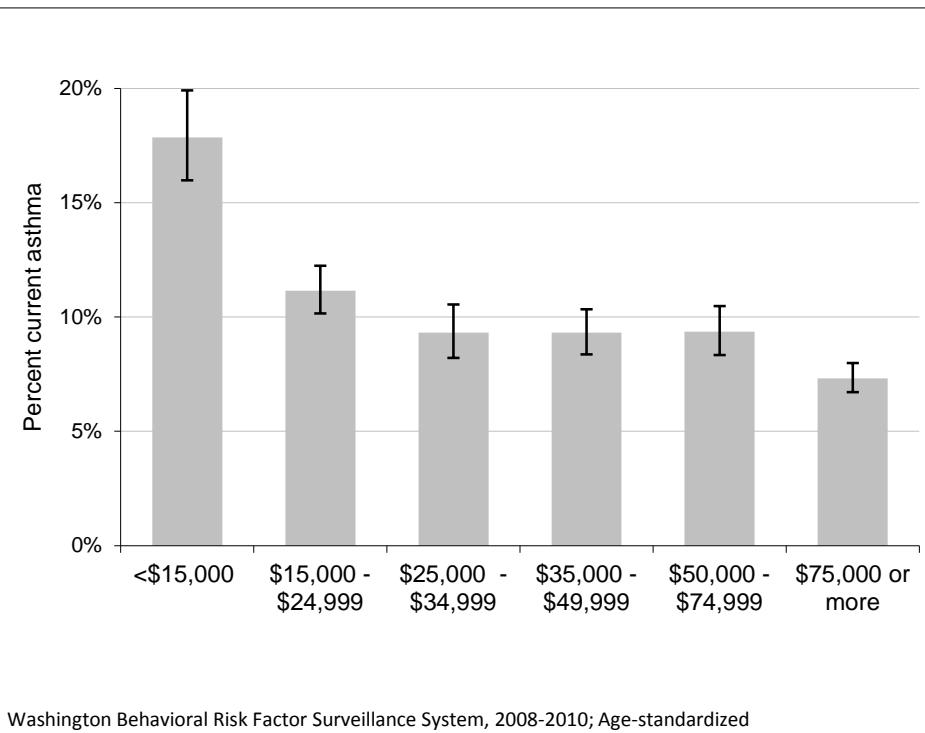
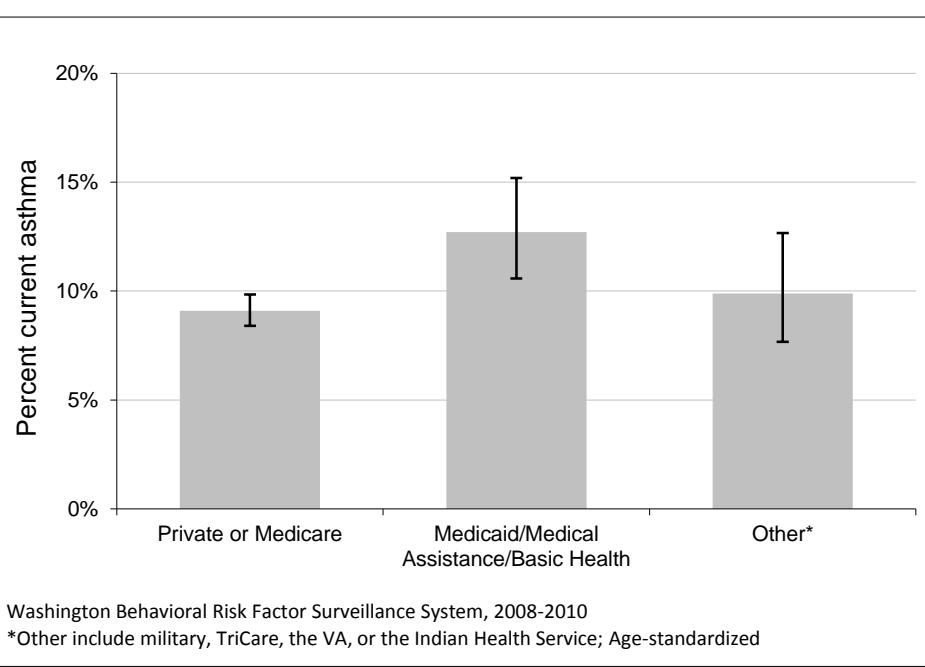


Figure 9. Adults with current asthma by current type of health insurance, 2008-2010



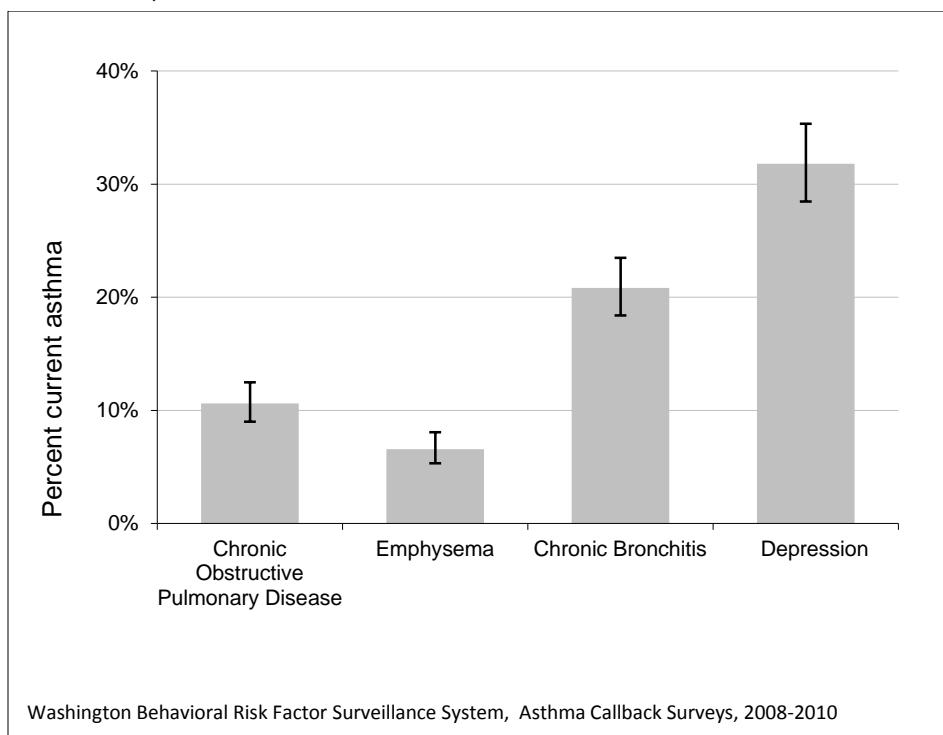
KEY FINDINGS

Medicaid, Medical Assistance, or Basic Health Plan clients are low-income, including pregnant women, other adults, seniors, and people with disabilities who generally have no other health coverage. Data show a strong association between household income and reporting current asthma. Individuals with lower income are more likely to have asthma than individuals with higher income.

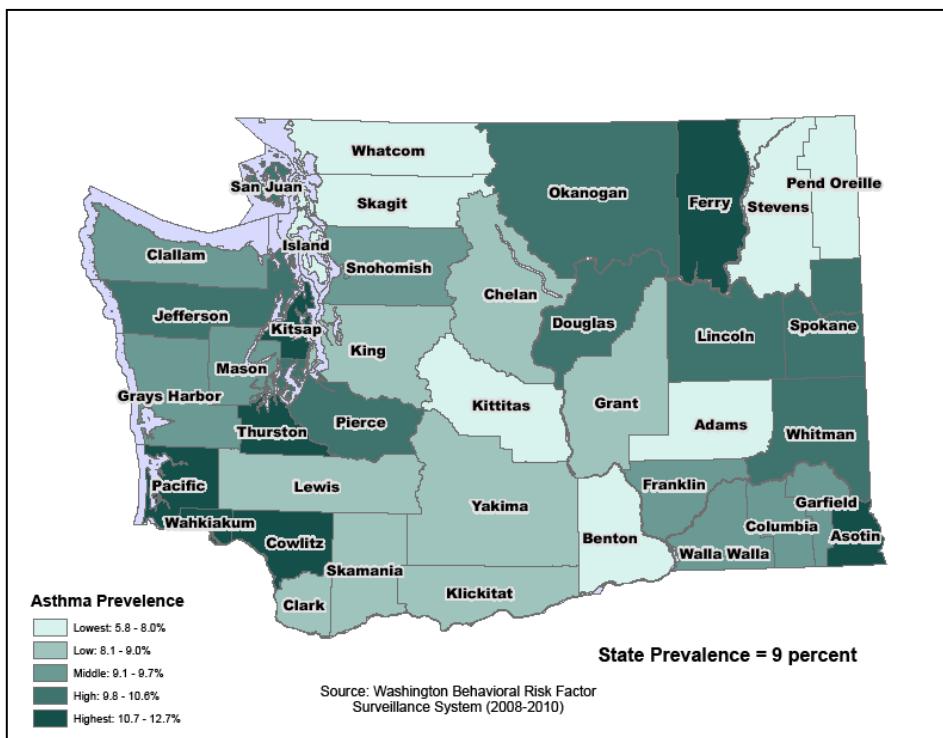
- People with household incomes less than \$15,000 per year (18 percent) were more than twice as likely to report asthma as people with household incomes of \$75,000 per year (7 percent) or more [Fig. 8].
- This may be because people with a household income of less than \$25,000 are more than three times likely to smoke than those who have a household income greater than \$50,000.²⁰
- Medicaid, Medical Assistance, or Basic Health Plan clients are more likely to report having asthma than people with private or Medicare health insurance [Fig. 9].

Reasons for higher asthma among lower socioeconomic status (SES) individuals are complex but they may be related to greater exposure to indoor and outdoor environmental triggers (such as tobacco smoke, particulate exhaust, and allergens) or greater prevalence of risk factors (smoking, obesity).

Figure 10. Adults with current asthma who report having other chronic conditions, 2008-2010



Map 1. Adults with current asthma by county, 2008-2010



KEY FINDINGS

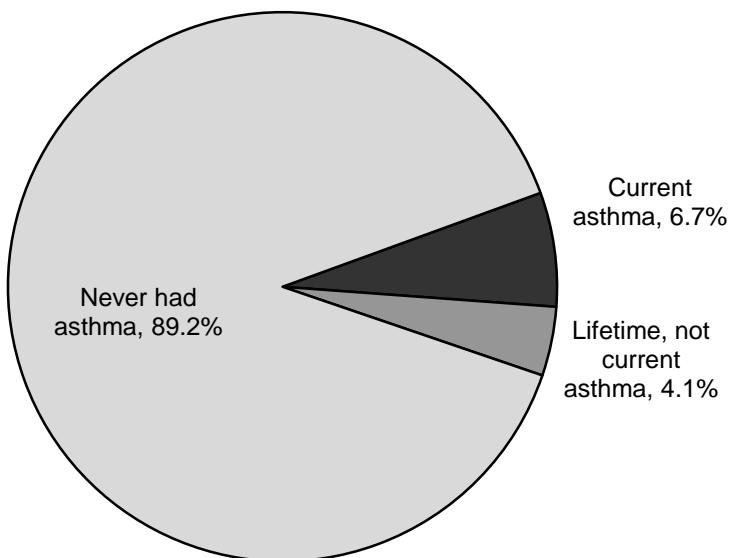
Asthma is associated with other types of chronic disease. People with asthma may also require treatment for associated conditions.

- Asthma affects mental health as well as physical health. Of the four questions about other health conditions asked in the Asthma Callback Survey, depression is the most common medical condition reported by people with asthma [Fig. 10].
- The next most common respiratory disease that people with asthma report having at some time during their life is chronic bronchitis [Fig. 10].

Though some counties have high local asthma prevalence, Map 1 does not show any clear regional patterns across the state.

- Asotin, Cowlitz, Ferry, Kitsap, Pacific, Thurston, and Wahkiakum counties have the highest prevalence of adult current asthma in Washington [Map 1].

Figure 11. Children with asthma, by adult proxy, 2009-2010



Washington Behavioral Risk Factor Surveillance System, Child Asthma Callback Survey, 2009-2010

KEY FINDINGS

Asthma affects about 1 in 10 kids. Generally, boys are more likely to report having asthma than girls [Fig 12].

- For 2009 and 2010 combined, Washington's child asthma rate was 6.7 percent [Fig. 11]. This is less than the national prevalence of 9.4 percent.²¹
- In 2010, more than 170,000 Washington children younger than 18 years of age were estimated as ever having lifetime asthma [Fig. 11] and nearly 110,000 were estimated to have current asthma [Fig. 12].

Figure 12. Children with current asthma by adult proxy, by sex, 2009-2010

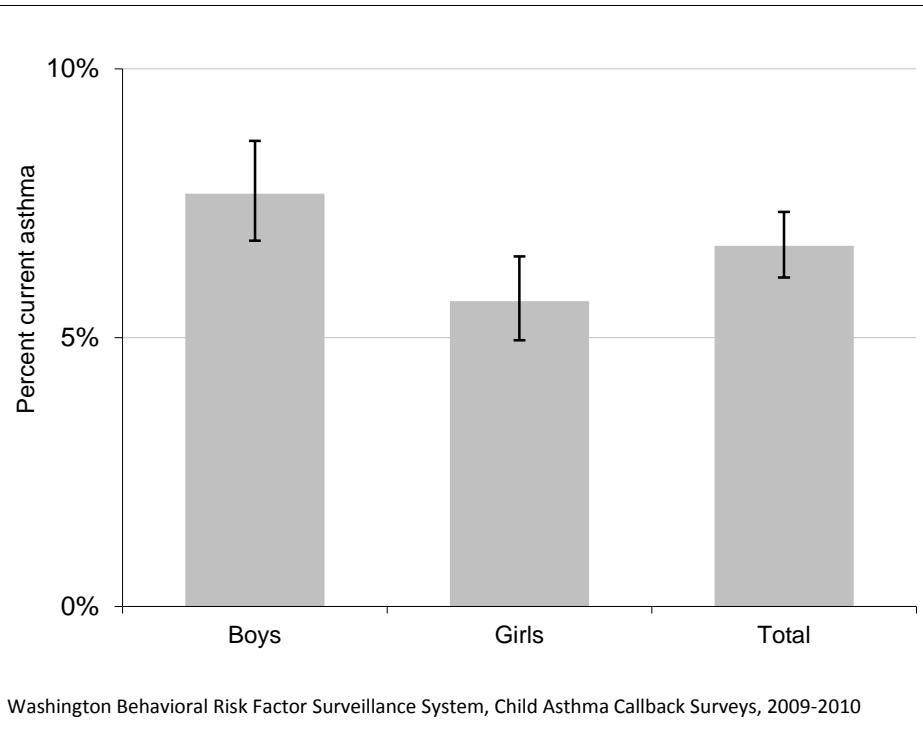
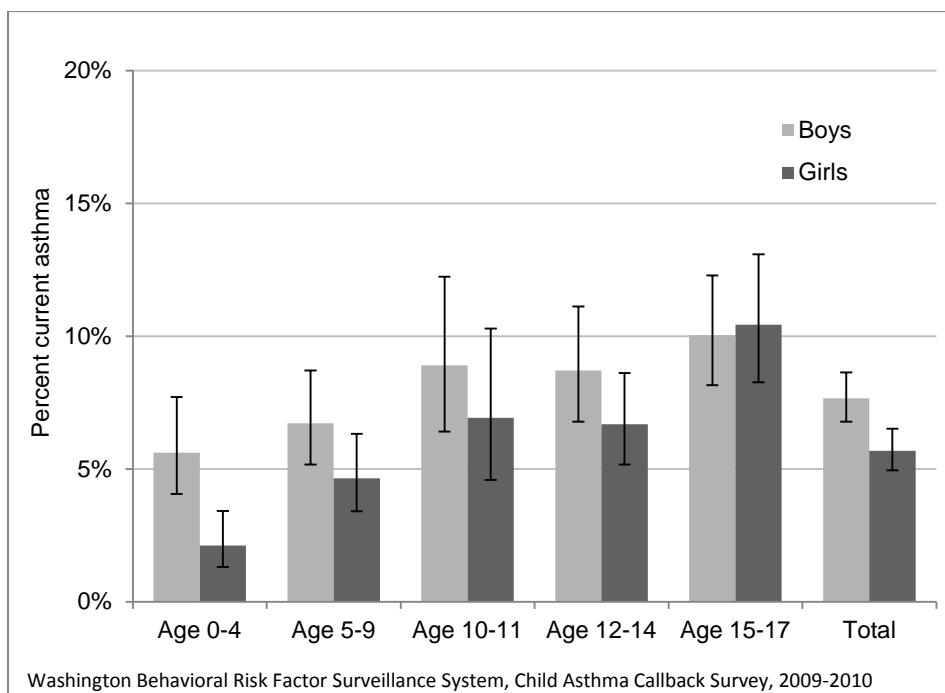


Figure 13. Children with current asthma by adult proxy, by age and sex, 2009-2010



KEY FINDINGS

In younger children, asthma is more common among boys [Fig 13] than girls, but by adulthood, asthma is more common among women than men [Fig 4].

- Data suggest that asthma increases with age for both males and females [Fig 4, Fig 13].
- However, in the later teen years, the gender gap of asthma begins to reverse where adult females are more likely to have asthma than adult males [Fig. 4]. This gender reversal from childhood to adults is not well-understood, despite having been widely noted.^{22, 23, 24}



Figure 14. Youth with lifetime asthma: Washington, 2002-2010

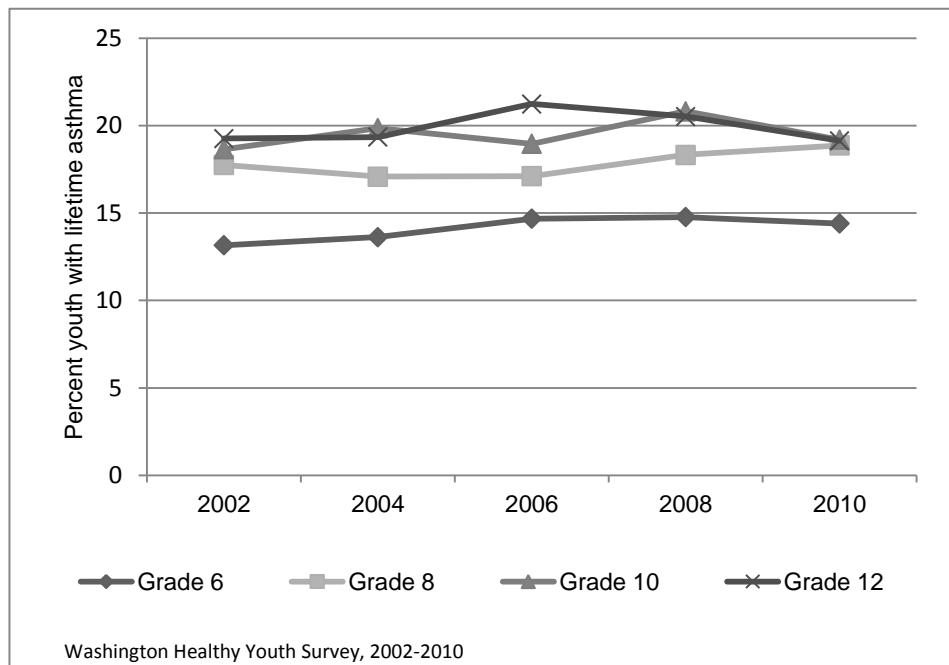
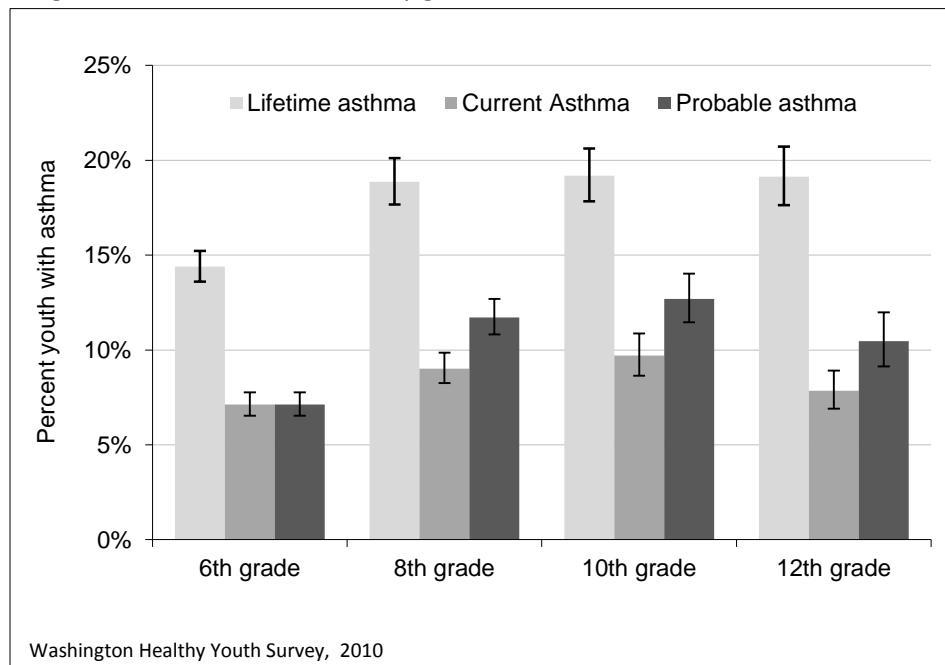


Figure 15. Youth with asthma by grade, 2010



KEY FINDINGS

When completing Washington's Healthy Youth Survey, some youth did not know if they had current asthma. We define "probable asthma" as youth with current asthma plus youth who do not know if they have asthma, but have one or more of the following:

- Took asthma medication during the past four weeks.
- Had asthma symptoms during the past four weeks.
- Visited the emergency room because of their asthma within the past year.
- Absent from school because of their asthma within the past year.
- In general, it is difficult to predict any trend for prevalence of youth with current asthma in Washington [Fig. 14].
- Older youth (grades 8, 10, and 12) were more likely than younger youth to report ever being told by a doctor that they have asthma. Youth in grades 8 and 10 were more likely than younger youth to have current asthma [Fig. 15].

Figure 16. Youth with current asthma by grade and sex, 2010

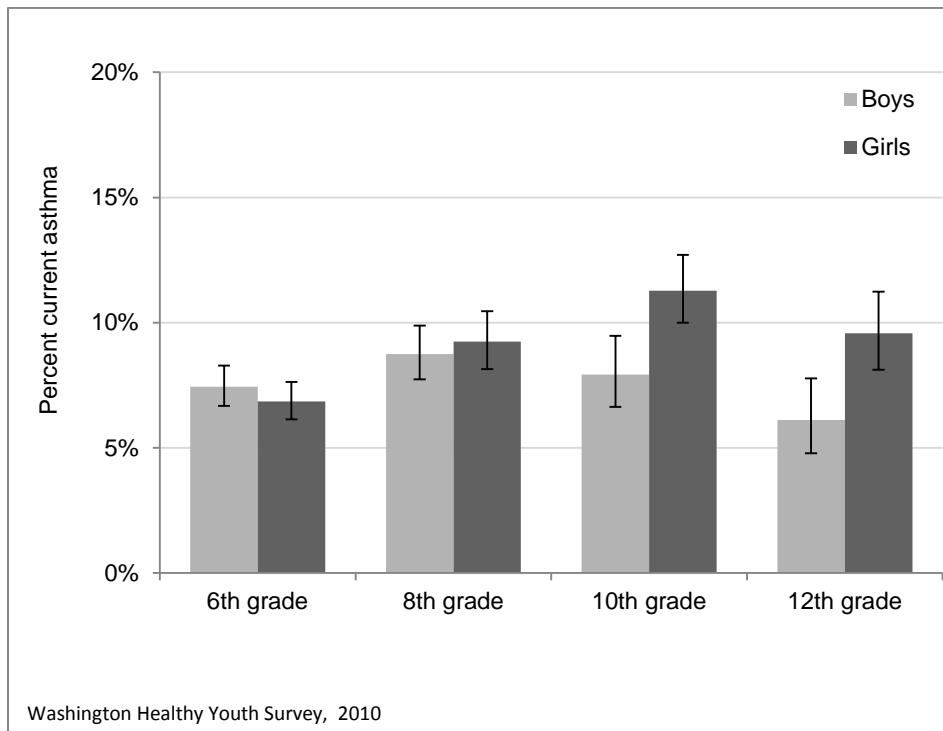
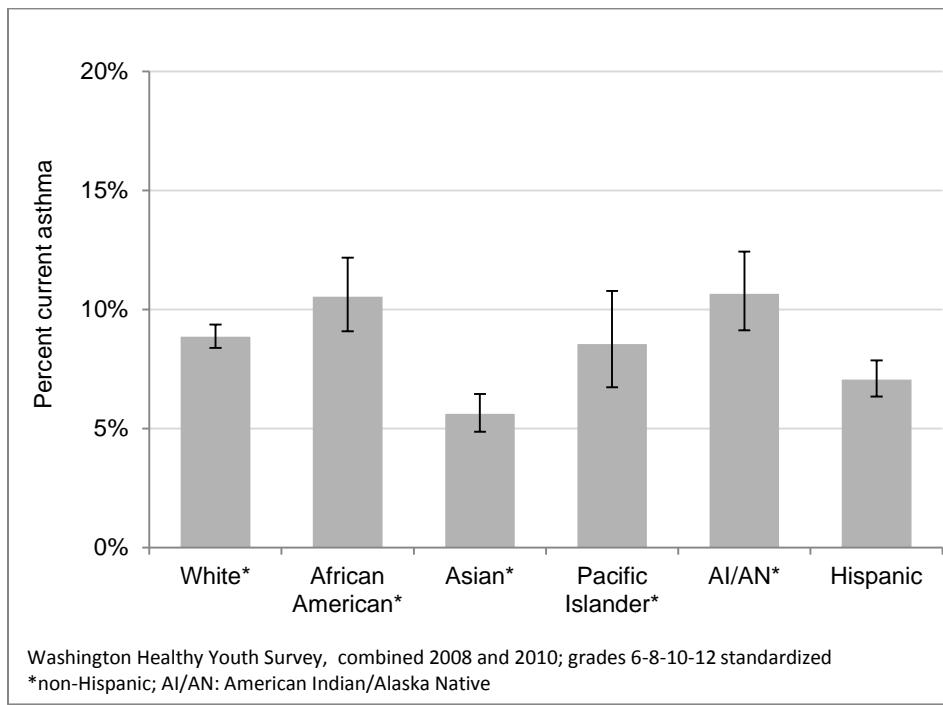


Figure 17. Youth with current asthma by race and Hispanic ethnicity, 2008 and 2010

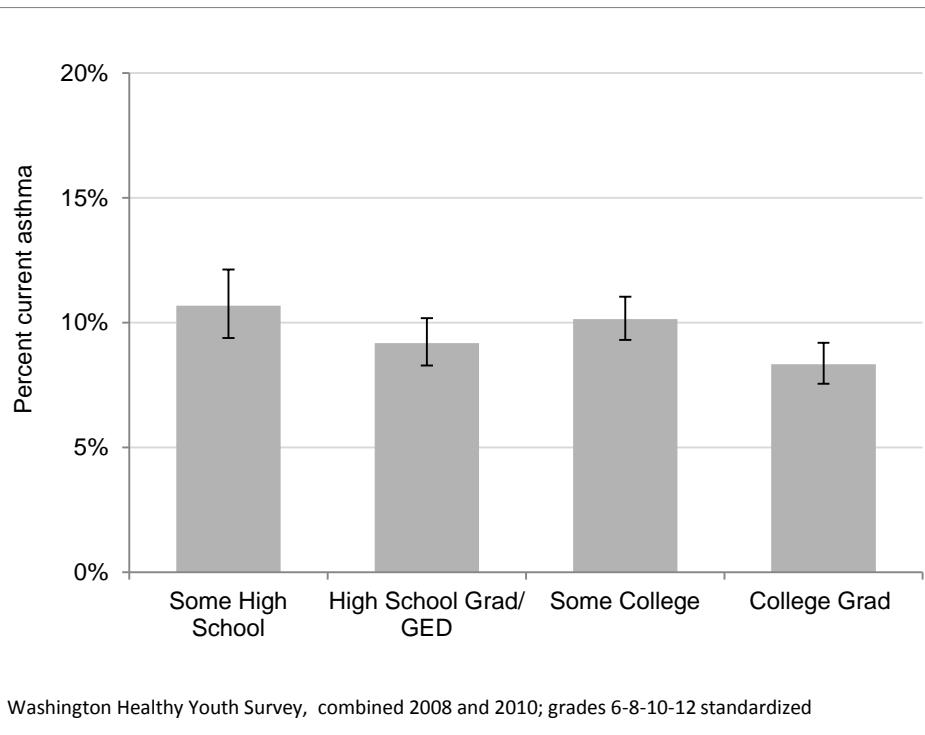


KEY FINDINGS

- Generally, adolescent boys are less likely to report having asthma than girls. The gap between boys and girls widens as they get older [Fig. 16].
- Girls in grades 10 (11 percent) and 12 (10 percent) are more likely to report having current asthma than boys in grades 10 (8 percent) and 12 (6 percent) [Fig. 16].
- Non-Hispanic Native American (11 percent) and non-Hispanic Black (11 percent) youth report higher asthma rates than other racial/ethnic groups. Similar to adults, youth of Asian (6 percent) or Hispanic (any race, 7 percent) descent report lower asthma rates than other racial/ethnic groups, except Pacific Islander [Fig. 17].

This survey does not allow for distinction of English from Spanish-speaking Hispanic youth.

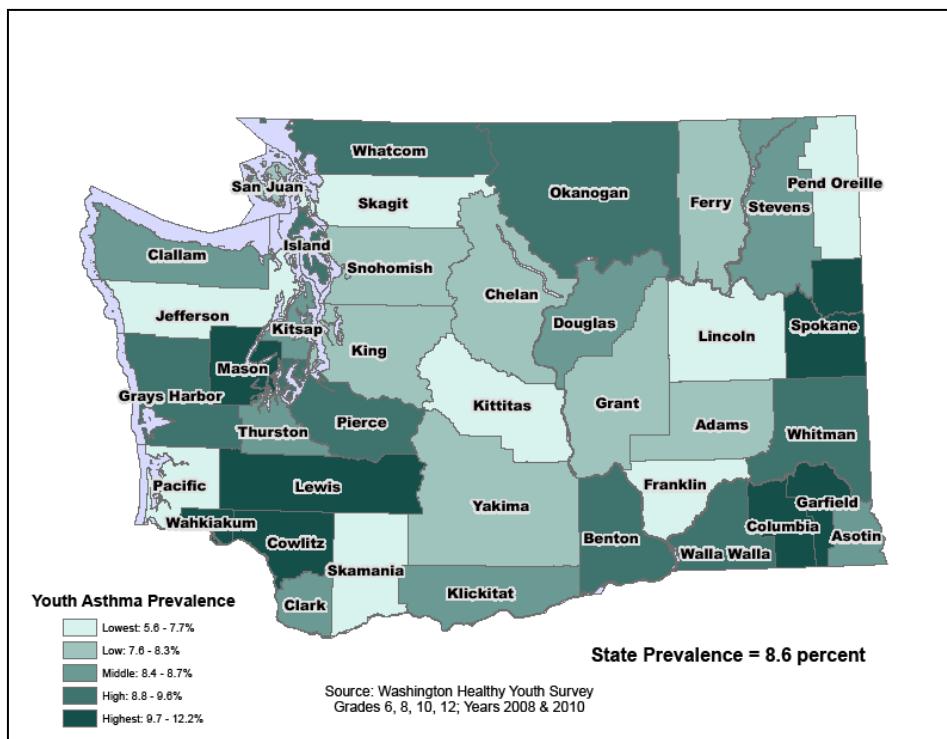
Figure 18. Youth with current asthma by maternal educational attainment, 2008 and 2010



KEY FINDINGS

- Youth whose mother completed four years of college were less likely to report current asthma (8 percent) than youth whose mother received less education (11 percent) [Fig. 18].
- Asthma among youth appears to be randomly distributed at the county level across the state with no clear clusters of high prevalence [Map 2].

Map 2. Youth with current asthma by county, 2008 and 2010



Risk factors are external circumstances or personal health behaviors that increase the chance that individuals will experience asthma episodes or exacerbations. Because asthma is a complex disease involving many risk factors, no one risk factor can explain asthma in Washington's population. Some of these factors are within an individual's control, such as smoking. Others are not, such as family history. Reporting of asthma risk factors in this report is limited to smoking, obesity, indoor and outdoor environmental factors, and outdoor air quality.



Risk factors for adult asthma were primarily monitored through the BRFSS and the companion Asthma Callback Survey to the BRFSS. The standard version of the BRFSS administered by all states only asks the lifetime and current prevalence questions. The BRFSS Asthma Callback Survey is a follow-up survey given to people who indicated on the BRFSS that they have asthma. Youth risk factors were monitored through the HYS.

The risk factors from BRFSS and HYS include smoking, secondhand smoke exposure, and obesity as measured by the Body Mass Index (BMI). BMI is a calculation using height and weight to determine

obesity (see the Centers for Disease Control and Prevention's growth chart web site at <http://www.cdc.gov/growthcharts/> for more details). Indoor asthma risk factors and actions taken by people with asthma to reduce these risk factors were monitored using the Asthma Callback Survey.

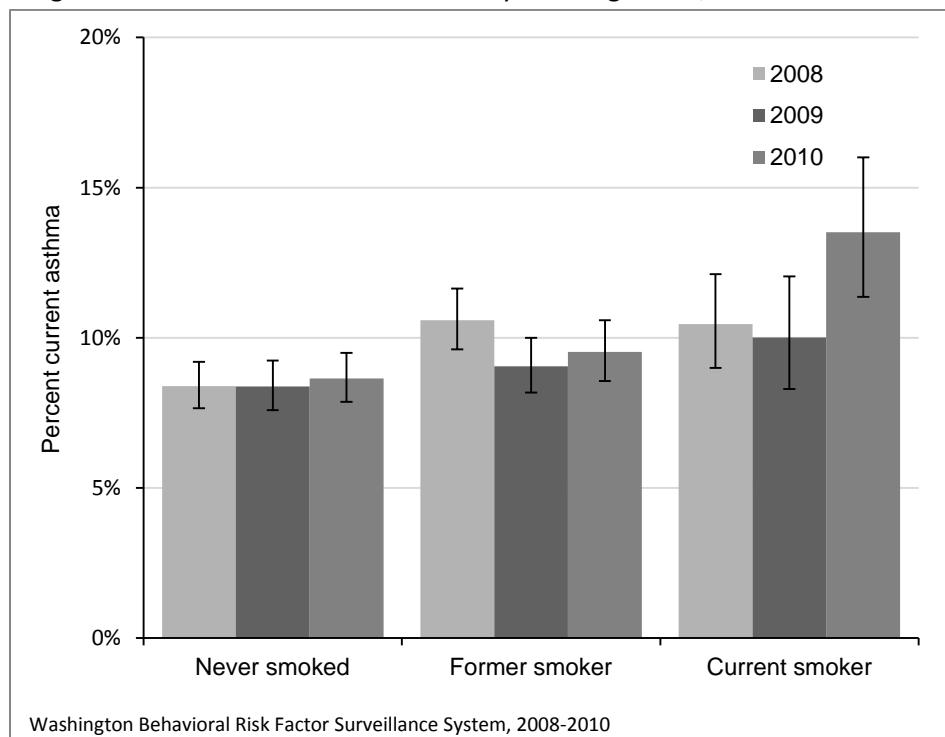
Outdoor Air Pollution: Air pollution can make asthma symptoms worse. Evidence from studies of children living near busy roadways suggests air pollution can also increase children's risk of developing asthma. Breathing polluted air can increase doctor and emergency department visits, result in hospitalizations and sometimes cause premature death. Particulate matter and ozone are two pollutants monitored by air agencies in Washington that are of concern to people with asthma. The Washington State Department of Ecology maintains a website that displays current air quality at each monitoring station in Washington at <https://fortress.wa.gov/ecy/enviwa/Default.htm>. Information on air quality can also be found from one of seven local clean air agencies: <http://www.ecy.wa.gov/programs/air/local.html>.

In Washington, particulate matter pollution, especially fine particles ($PM_{2.5}$) is typically worse during the fall and winter. This is when there is a lot of smoke from wood stoves and fireplaces, and inversion weather patterns produce still air that allows $PM_{2.5}$ pollution to build up. Other places where particle exposure is likely to happen are near busy roads or ports.

The Washington State Department of Ecology and regional clean air agencies monitor $PM_{2.5}$ in Washington counties. Twenty-seven counties have monitors; 12 do not. Based on data from the Washington Tracking Network, in 2009, seven counties (Clark, King, Kitsap, Pierce, Snohomish, Thurston and Yakima) experienced days in which $PM_{2.5}$ levels in parts of the county were above the daily health-based standard of 35 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).²⁵

Sunny, hot weather combined with vehicle exhaust, gasoline vapors, and other outdoor air pollutants will produce higher levels of ozone. There are two kinds of ozone. "Good" ozone forms naturally about 10 to 30 miles above the Earth's surface. It helps protect life on Earth from the sun's harmful rays. But ozone at ground level can be harmful – it's the main ingredient in smog and can cause breathing difficulty for people who have asthma.

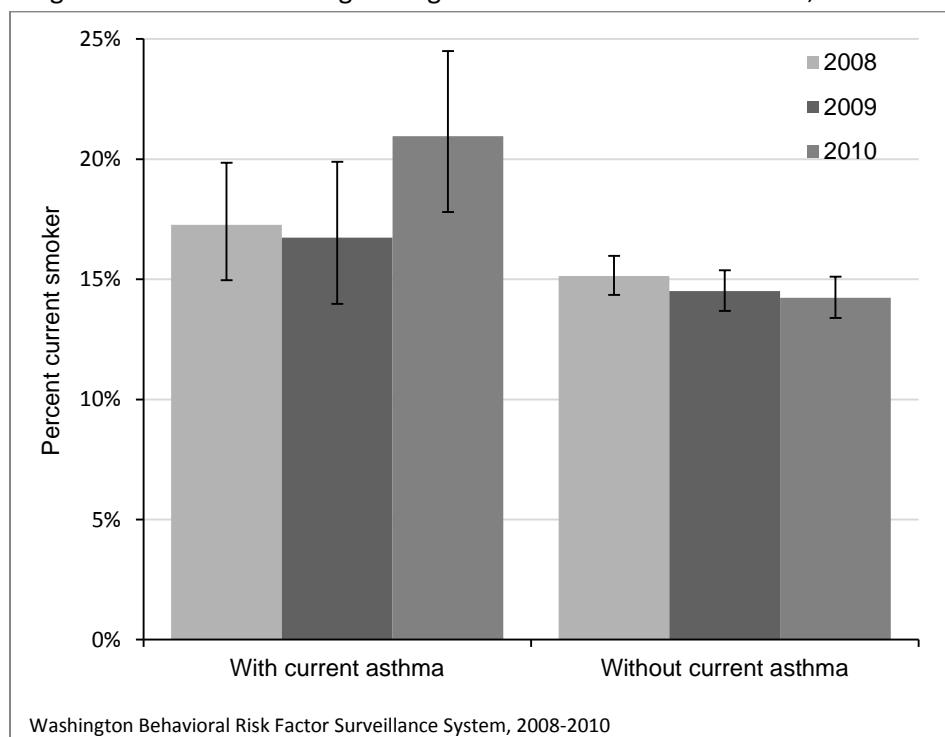
Figure 19. Adults with current asthma by smoking status, 2008-2010

**KEY FINDINGS**

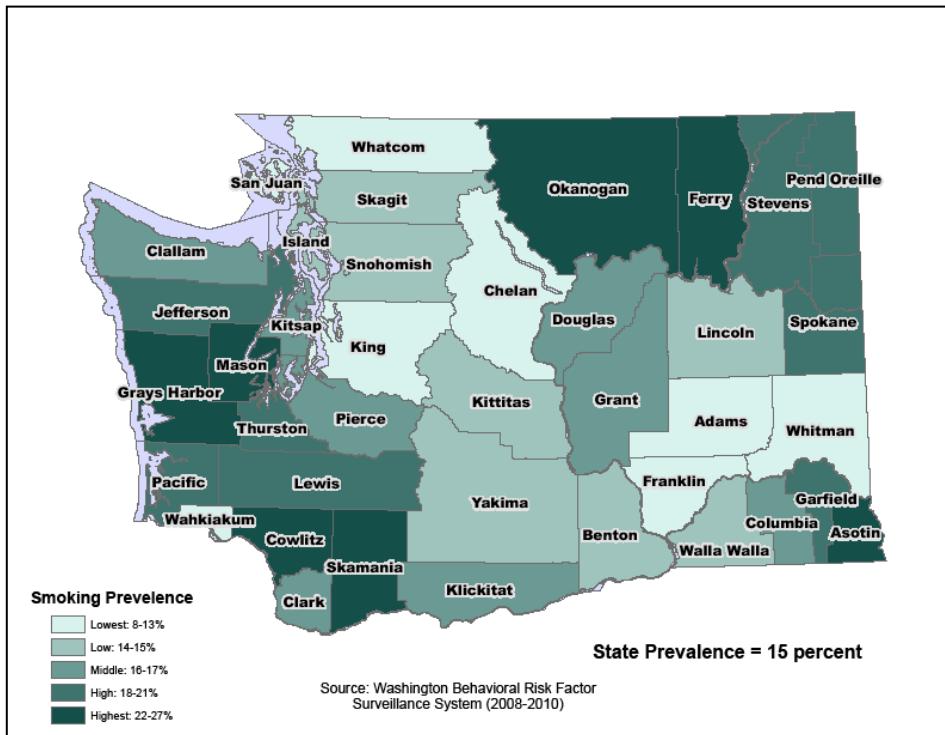
Tobacco smoke is a potent trigger for asthma and researchers agree that people with asthma who smoke have more severe symptoms than people with asthma who do not smoke.²⁶

- In 2010, smoking history was associated with current asthma [Fig.19]. Current smokers are more likely to have asthma (14 percent) than former smokers (10 percent) or people who never smoked (9 percent). In previous years, a similar pattern was observed although these differences did not reach statistical significance.
- People with asthma (21 percent) are more likely to be smokers than those without asthma (14 percent) [Fig. 20].

Figure 20. Current smoking among adults with or without asthma, 2008-2010



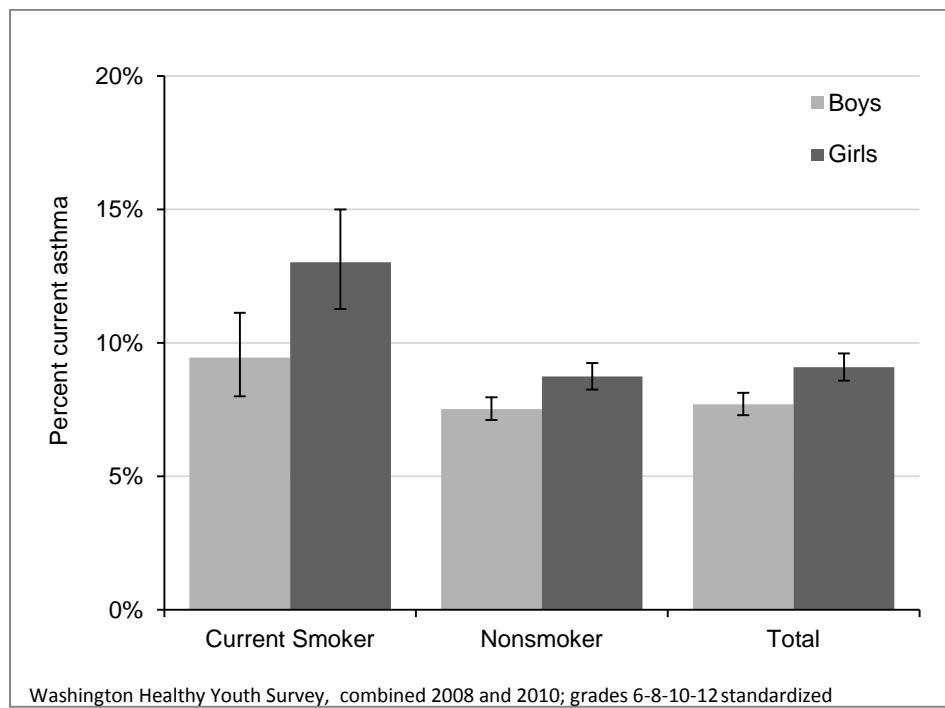
Map 3. Adult cigarette use by county, 2008-2010



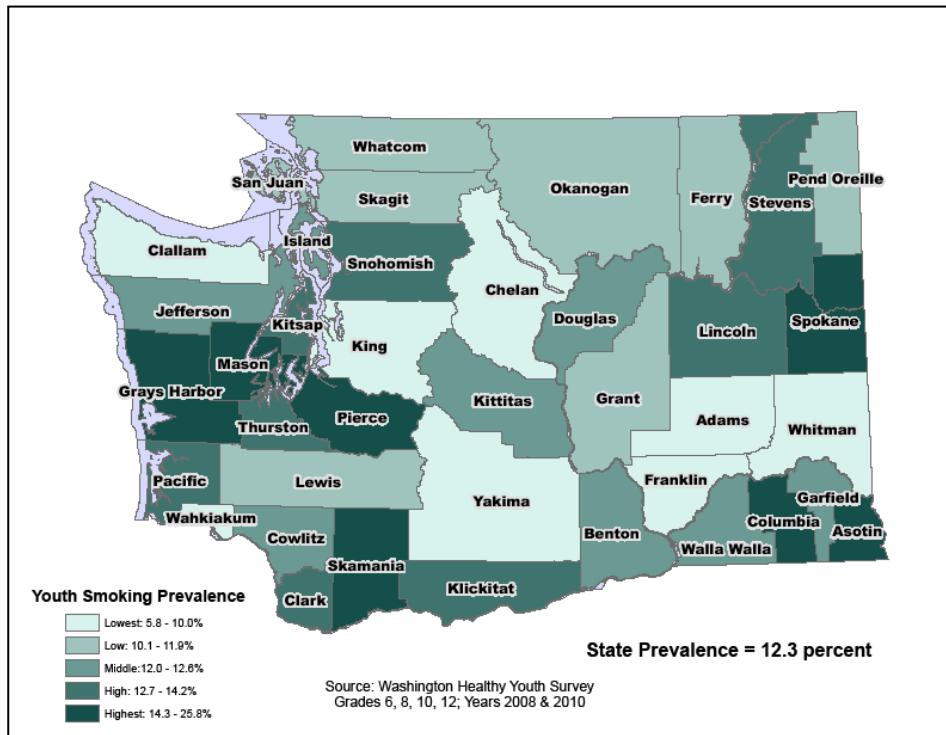
KEY FINDINGS

- In general, the northeastern and southwestern counties of Washington have the highest percentages of adults who smoke [Map 3]. The statewide adult smoking rate is 15 percent.²⁰
- Among youth, active smoking is associated with asthma for both boys and girls [Fig. 21]. Early initiation of active smoking is a risk factor for asthma in youth.²⁷

Figure 21. Youth with current asthma by smoking status and gender, 2008 and 2010



Map 4. Youth cigarette use by county, 2008 and 2010

**KEY FINDINGS**

- In general, the northeastern and southwestern counties of Washington have the highest percentages of youth who smoke [Map 4]. The statewide youth smoking rate is 12.3 percent.²⁰
- Adults exposed to second hand smoke in the home are more likely to report lifetime asthma than those not exposed [Fig. 22].

Figure 22. Lifetime and current asthma among adults by exposure to second hand smoke in the home, 2008-2010

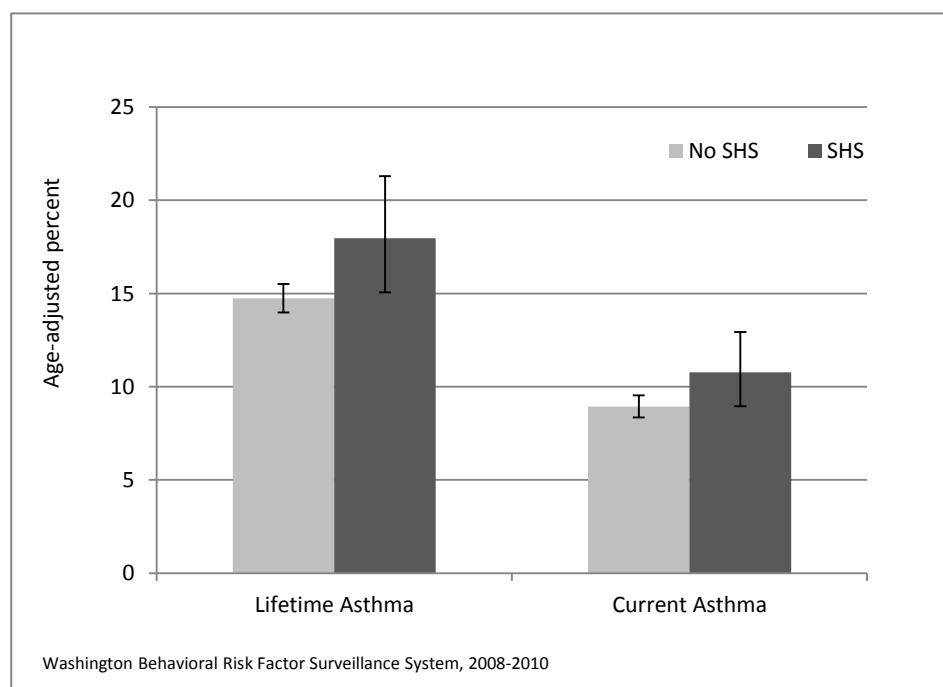
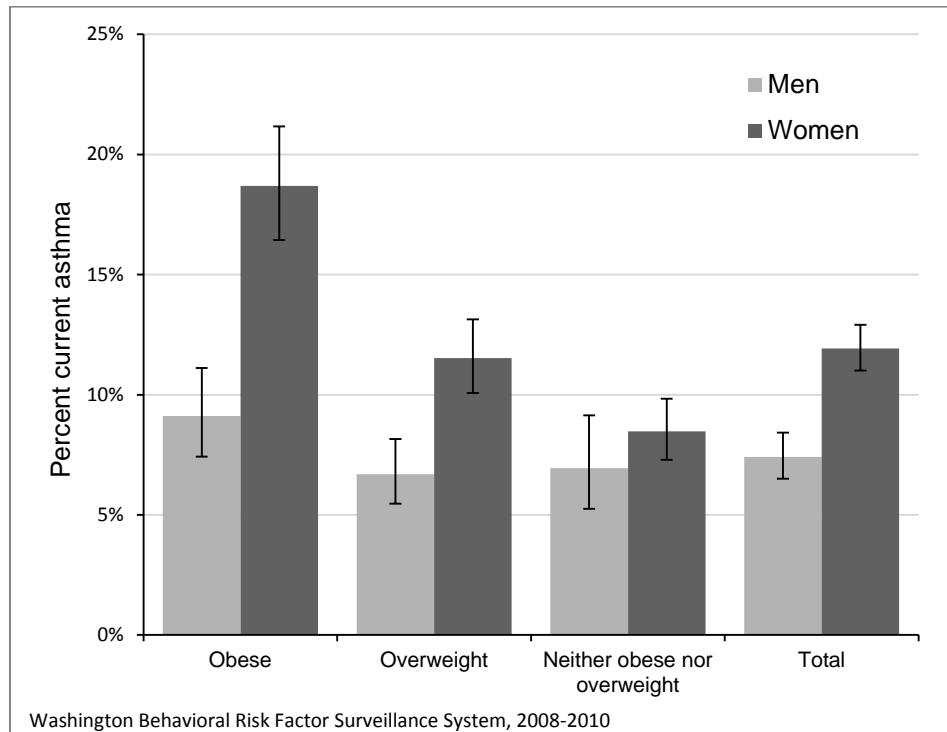
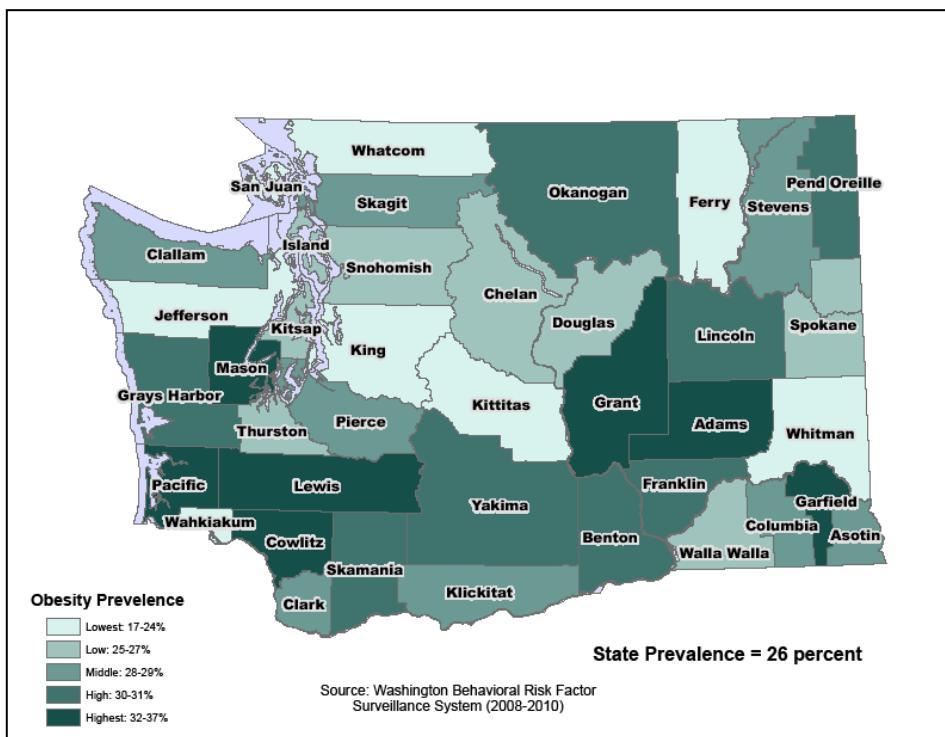


Figure 23. Adults with current asthma by BMI status and gender, 2008-2010



Map 5. Adult obesity by county, 2008-2010

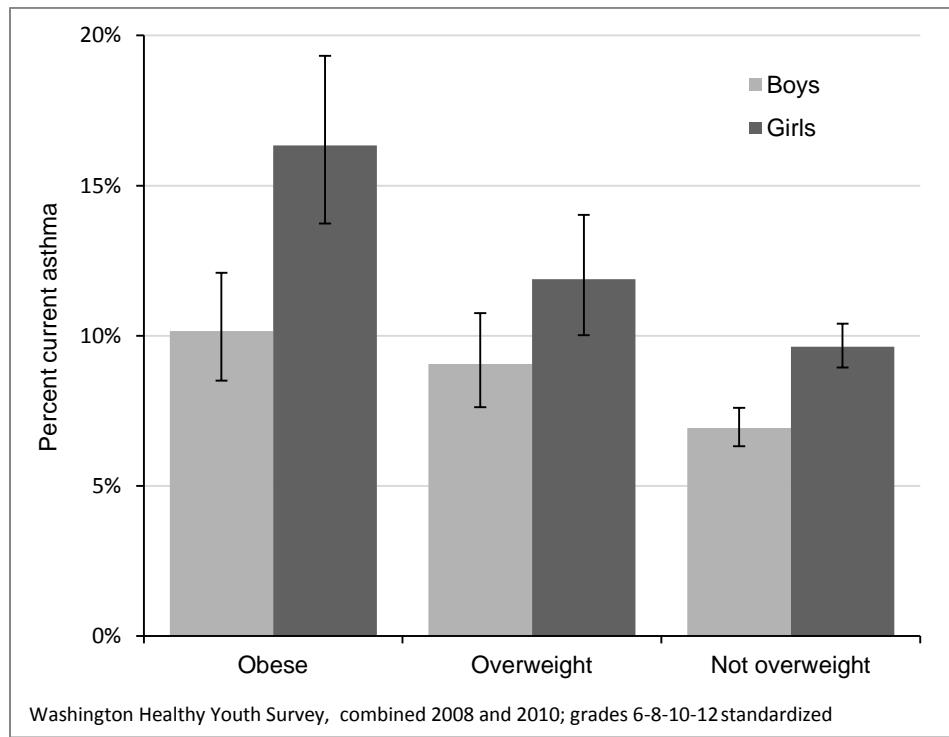


KEY FINDINGS

Evidence suggests obesity is associated with greater risk of developing asthma, as well as worsened asthma symptoms.^{28,29}

- In Washington, higher body mass index is significantly associated with higher prevalence of asthma for women [Fig. 23]. Nearly one in five obese women (19 percent) reported having asthma in contrast to one in eleven women who are not overweight (9 percent).
- The statewide adult obesity rate is 26 percent and has doubled in the past decade.¹⁰
- There is a regional pattern among counties with high percentage of adult obesity. The southwestern corner of the state has higher levels of adult obesity than the rest of the state [Map 5].

Figure 24. Youth with current asthma by BMI status and gender, 2008 and 2010



KEY FINDINGS

- Among Washington youth for both genders, higher levels of obesity and overweight were associated with increasing prevalence of current asthma [Fig. 24].
- In Washington, adults and youth with asthma are more likely to be obese than the general population.¹⁰
- Adams, Garfield, Grant, Grays Harbor, Mason, Skamania, and Yakima counties have the highest rates of youth obesity in the state [Map 6].
- Of these counties, Garfield, Grays Harbor, and Mason also have some of the highest rates of youth with current asthma [Map 2].

Map 6. Youth obesity by county, 2008 and 2010

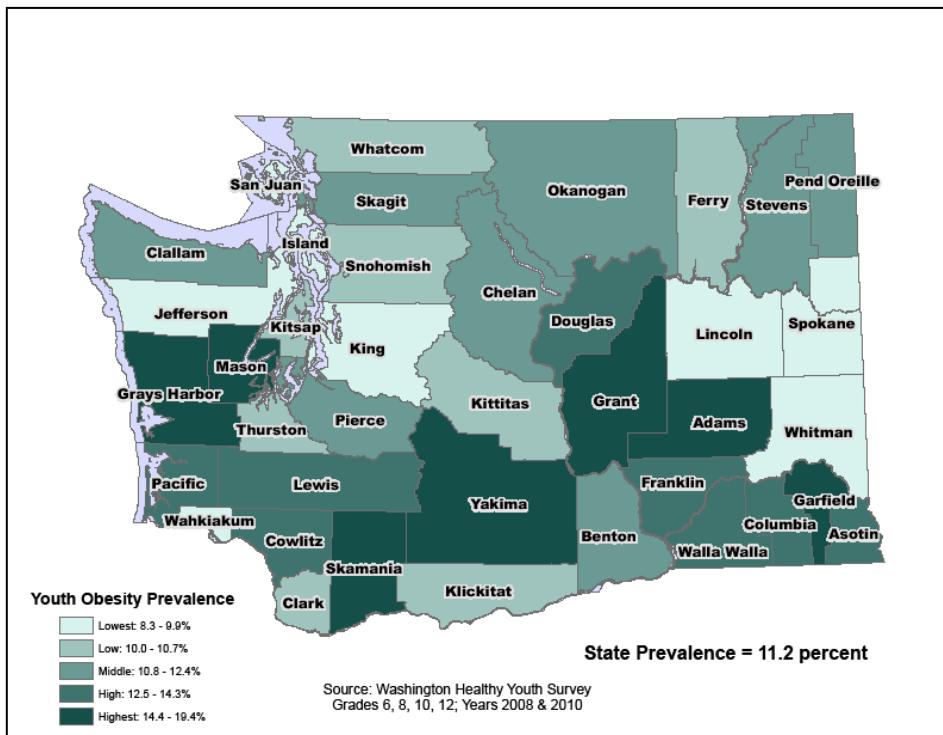


Table 1. Indoor air exposures proven to cause or trigger asthma

Indoor Air Exposure	Cause of Asthma	Trigger of Asthma (Exacerbation)
Dust Mite Allergen	XXX	XXX
Cockroach Allergen	XX*	XXX
Dog Allergen		XX
Cat Allergen		XXX
Fungi/Mold		XX
Secondhand Tobacco Smoke	XX*	XXX
Indoor Chemical Exposures (Fragrances, non-specific exposures)	X	XX
Dampness Indoors/Home	X	XX
NO ₂ (e.g. gas appliances in poorly ventilated kitchens)		XX

* among young children only

X = Limited evidence for association

XX = Sufficient evidence for association

XXX = Sufficient evidence for causation

Table 2. Indoor asthma triggers and actions to reduce risk among adults and children with current asthma

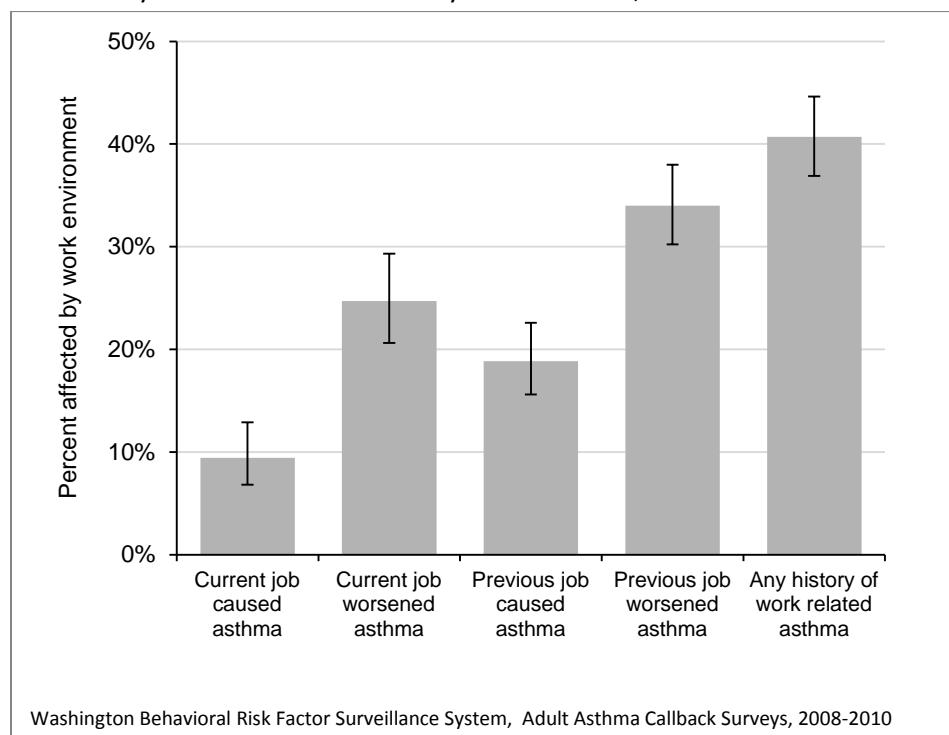
Indoor asthma triggers	Adult ⁶		Children ³³	
	%	95% CI	%	95% CI
Have indoor pets	69.7	66.1-73.1	73.4	66.7-79.0
Carpeting or rugs in bedroom	74.6	70.7-78.1	75.5	68.9-81.0
Pets allowed in bedroom	75.7	70.8-80.0	58.8	50.9-66.3
Gas used for cooking	22.7	19.1-26.7	30.4	24.6-36.8
Wood burning fireplace/stove	26.3	22.8-30.2	22.4	17.5-28.4
Smoking inside the home, past week	10.7	7.9-14.2	2.4	1.2-4.6
Mold inside the home, past 30 days	12.5	9.9-15.7	11.7	8.1-16.5
Pests (mice, rat, or cockroaches) inside the home, past 30 days	5.1	3.6-7.0	2.5	1.4-4.4
Gas fireplace or unvented gas stove	3.4	1.6-7.2	*	*
Actions to reduce risk				
Exhaust fan used in the bathroom	76.4	72.6-79.9	76.3	70.1-81.6
Exhaust fan in kitchen regularly used	68.4	64.7-71.9	75.3	69.4-80.5
Sheets and pillowcases washed in hot water	39.9	36.0-43.9	46.9	40.2-53.6
Dehumidifier regularly used	8.1	6.2-10.5	9.1	6.1-13.4
Mattress cover used	31.6	27.9-35.7	40.1	33.6-47.0
Pillow cover used	29.4	25.9-33.1	34.9	28.8-41.6
Air cleaner or purifier regularly used	33.6	29.9-37.5	32.8	26.7-39.5

* This number is suppressed because of too few respondents

KEY FINDINGS

- Indoor environment can have a big impact on people with asthma. Table 1 summarizes reviews of the evidence for indoor air exposures that can influence asthma.^{30, 31, 32} Some of the exposures indicated could be easily reduced or modified in the environment.
- Seventy-five percent of people with asthma live in homes with carpeting or rugs in the bedroom and 70 percent allow pets inside the home [Table 2].
- Second hand smoke (SHS) exposure is smoke from other peoples' cigarettes, pipes, or cigars. In Washington, about 11 percent of people with asthma report being exposed to SHS in the home [Table 2]. These data suggest a need to educate people with asthma and their families about the risks of smoking in the home.
- Burning wood for heat and cooking with gas generate particulate matter and gases that can exacerbate asthma. Some people with asthma use wood burning fireplaces or stoves (26 percent), cook with gas (23 percent), or have seen or smelled mold inside the home (13 percent) [Table 2]. All these can be indoor asthma triggers.
- Most people with asthma report using exhaust fans in the bathroom (76 percent) and kitchen (68 percent) [Table 2]. Using fans that exhaust to the outside can help lower humidity levels. High humidity can promote growth of biological agents, such as mold.

Figure 25. Adults who reported their asthma had been caused by or made worse by the work environment by asthma status, 2008-2010



KEY FINDINGS

Irritants in workplace environments can also cause or aggravate asthma. About 20 percent of all adult onset asthma is thought to be caused by workplace exposure.^{34, 35}

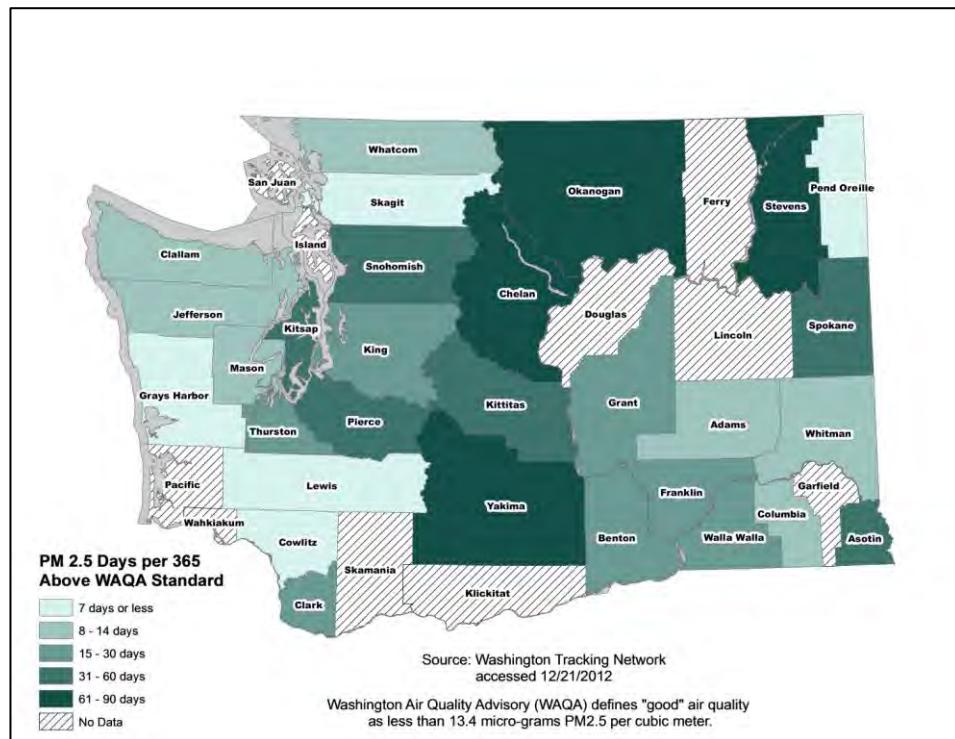
- About one in four workers (24.7 percent) with current asthma reported their current job worsened their asthma [Fig. 25].
- About 40 percent of adults reported their asthma had been caused or worsened by their current or previous job [Fig. 25].
- Worksite policies can have a significant effect on the presence or absence of potential asthma triggers. In 2008, a sample of worksites throughout Washington State was surveyed about their policies and practices related to indoor air quality. Results from the survey show hospitals, healthcare facilities and retirement homes were the most likely to have policies that supported improved air quality [Table 3].

Table 3. Indoor air policies or practices by business type, 2008³⁶

	Office	Store	Warehouse, factory, construction	Restaurant	Hospital, health care facility, retirement	Other	All businesses
Has a 'scent free' or 'perfume free' policy	16.3%	7.8%	7.3%	21.5%	35.7%	11.1%	15.9%
Someone responsible for checking HVAC airflow	81.6%	69.4%	80.3%	93.2%	89.1%	83.6%	82.1%
Someone responsible for checking indoor air quality	62.0%	51.7%	59.0%	64.3%	70.7%	60.8%	61.4%
Has a policy or requirement to use only non-irritating cleaning agents	32.3%	39.1%	17.9%	45.0%	62.5%	38.3%	37.2%

Table 4. Outdoor air exposures that cause or trigger asthma

Pollutant	Source	Effect on Asthma
Ozone	Principal component of smog. A summer time air pollutant usually formed after several consecutive days of hot sunny weather. Formed when vehicle exhaust and industrial emissions react with sunlight.	Exposure associated with asthma development among children frequently playing outdoor sports. Exposure increases symptoms and emergency room visits among people with asthma. Breathing ozone can prematurely age the lungs and decrease lung function.
Fine Particulate Matter (PM)	Easily inhaled tiny particles including dirt, soot, dust, smoke or unburned fuel, and aerosols suspended in the air that come from mobile vehicles – especially wood stoves and fireplaces, backyard and agricultural burning, diesel exhaust, industry, wildfires and mining.	Exposure increases symptoms and emergency room visits among people with asthma, decreases lung function.
Carbon Monoxide	Combustion, including motor vehicles and wood smoke.	Exposure increases symptoms among people with asthma.
Nitrogen oxides (NO _x)	Fuel emissions from mobile sources such as cars or trucks.	Exposure increases symptoms among people with asthma.
Sulfur dioxide (SO ₂)	Typically from industrial sources, such as power plants, that burn sulfur-containing fuels like coal and oil. Mt. St. Helens is also a periodically significant source of SO ₂ in Washington State.	Exposure increases symptoms among people with asthma and can cause increased emergency department visits.

Map 7. Washington State number of days PM_{2.5} levels were higher than Washington Air Quality Advisory standard by county, 2010

KEY FINDINGS

- Outdoor air pollutants known to cause or aggravate asthma are listed in Table 4.^{37, 38, 39}
- According to the Washington State Department of Ecology Air Quality Advisory (WAQA) standards, 14 counties experienced more than 14 days of “moderate” to “unhealthy” air quality in 2010. No county experienced “very unhealthy” or “hazardous” days in 2010.⁴⁰

Asthma management refers to education, instruction, and medical or pharmacological care received by people with asthma. The core of self-management is the individualized asthma health care plan created in partnership with the healthcare provider. Beyond assuring good quality care, having access to care is essential. People with asthma can have a higher quality of life when they have control of their asthma and asthma symptoms. Asthma quality of life can be measured by information such as missing work or school, inability to carry out usual activities, or perceived poor health status.

For adults, asthma management, access to care and utilization, and quality of life were monitored through the BRFSS and the companion Asthma Callback Survey to the BRFSS. Youth asthma management, access to care and utilization, and quality of life were monitored through the HYS.

Most of life disruption caused by asthma could be avoided if people with asthma are actively involved in their care and their healthcare providers manage their disease according to established clinical guidelines. The ultimate goal of asthma management is to have well-controlled asthma so that adults and children with asthma can live normal, active lives.



Figure 26. Self-management and education among adults with current asthma, 2008-2010

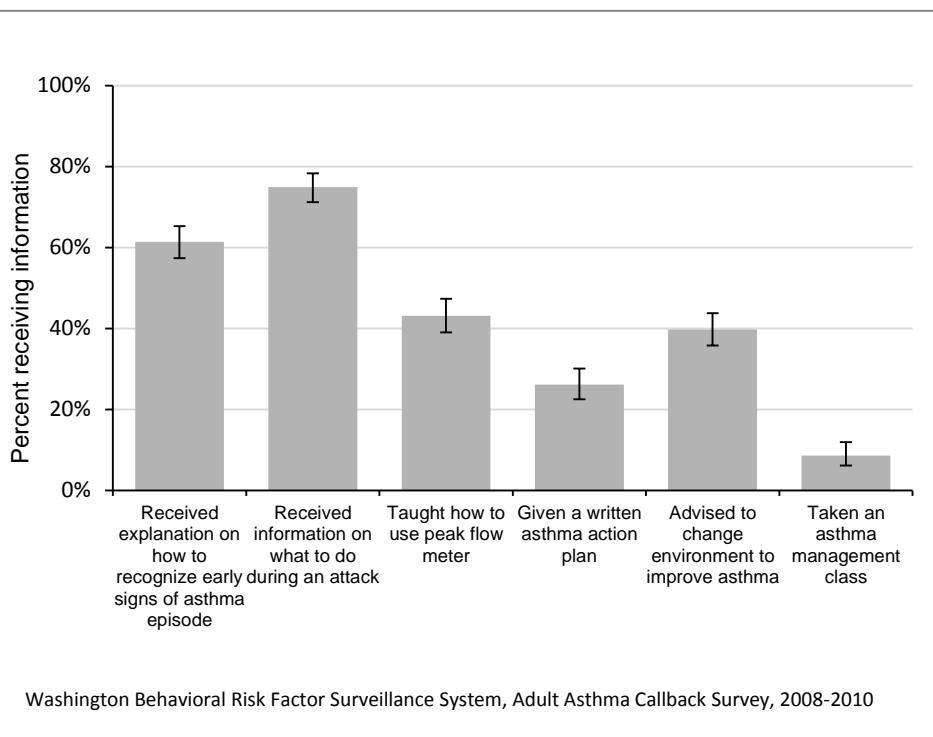
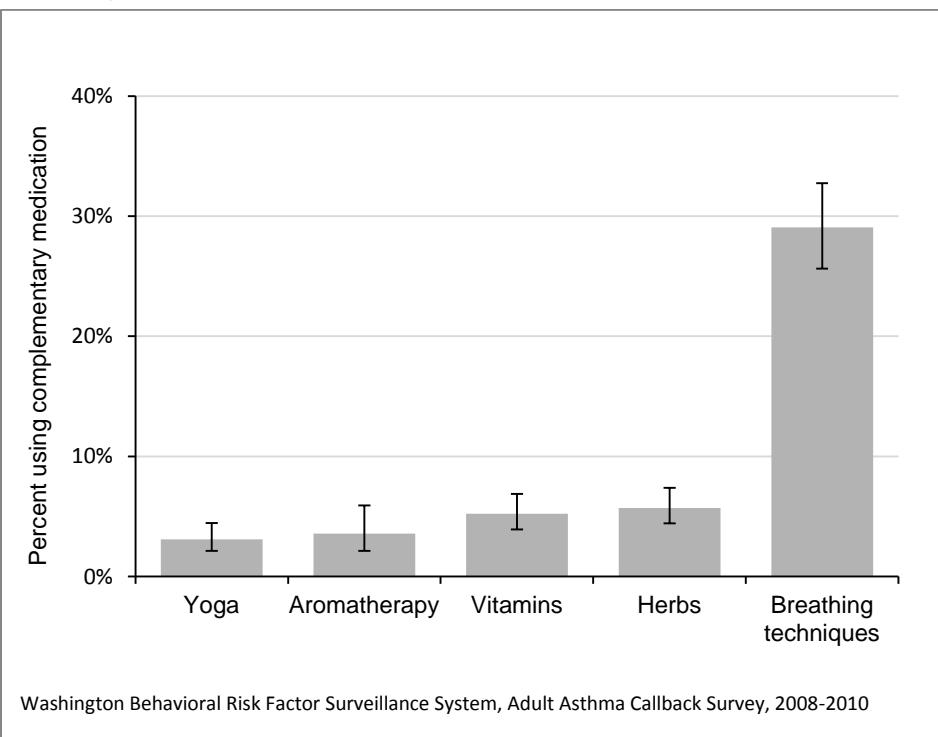


Figure 27. Use of complementary medication among adults with current asthma, 2008-2010



KEY FINDINGS

Advances in medical therapies and self management education make controlling asthma a realistic goal for most patients.

- The majority of adults with asthma received training in recognizing early signs of an asthma episode (61 percent) and received information on the appropriate response to it (75 percent) [Fig. 26].
- Very few adults with asthma have taken an asthma management class (9 percent) or received a written asthma action plan (26 percent) [Fig. 26]. Having both an asthma action plan and completing an asthma management class are recommended as the standard of care.
- Complementary and alternative methods for asthma control can include:
 - Herbs
 - Vitamins
 - Acupuncture
 - Acupressure
 - Aromatherapy
 - Homeopathy
 - Reflexology
 - Yoga
 - Breathing techniques
 - Naturopathy
- The top five methods used by people with asthma are shown in Figure 27.
- Breathing techniques were the most common complementary and alternative method mentioned for controlling asthma in adults [Fig. 27].

Figure 28. Washington youth with asthma who have a written asthma plan, 2008 and 2010

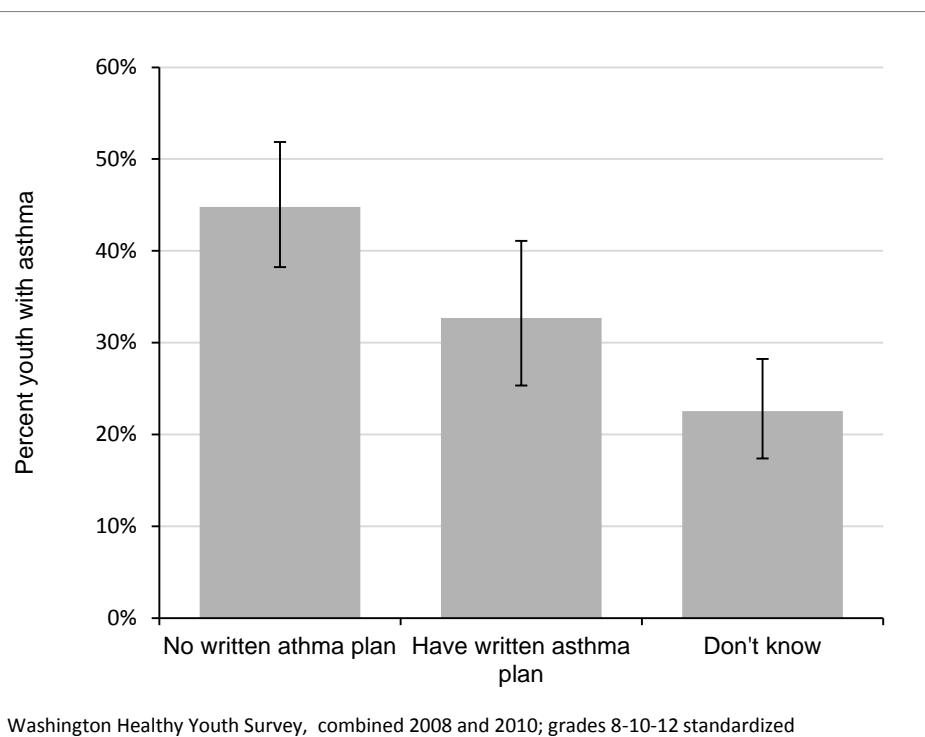
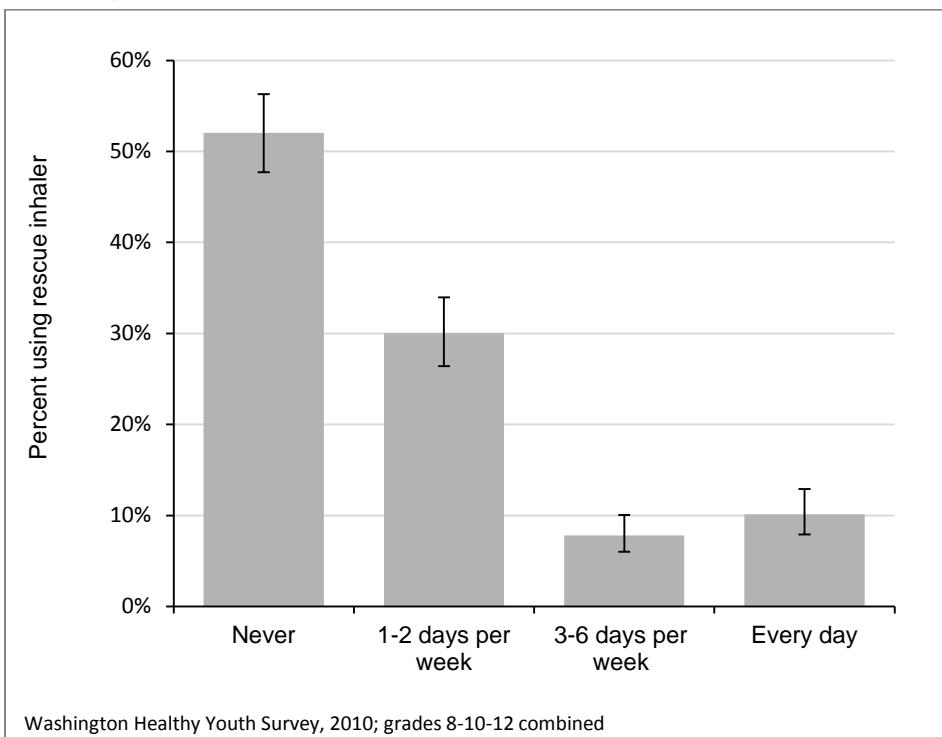


Figure 29. Frequency rescue inhaler use in past month among youth with asthma, 2010



KEY FINDINGS

Since the purpose of an asthma plan is to provide instructions about medication and self-management strategies, the plan can only be considered effective if the youth are aware of it.

- Only a third of Washington youth with asthma report having received a written asthma action plan from their healthcare provider. An additional 23 percent did not know whether they had received a plan [Fig. 28]. This represents a missed opportunity to promote better self-management for effective asthma control.
- Quick-relief medicines (also known as “rescue” medication, typically an inhaler) control symptoms of an asthma attack. A goal of good asthma control is to use them two times a week or less. Increasing use of quick-relief medicines indicates inadequate control strategies. About half of youth (48 percent) in Washington report using a rescue inhaler at least once per week in the past month, with 10 percent of youth using it every day [Fig. 29].

Figure 30. Access to health care among adults with or without asthma, 2010

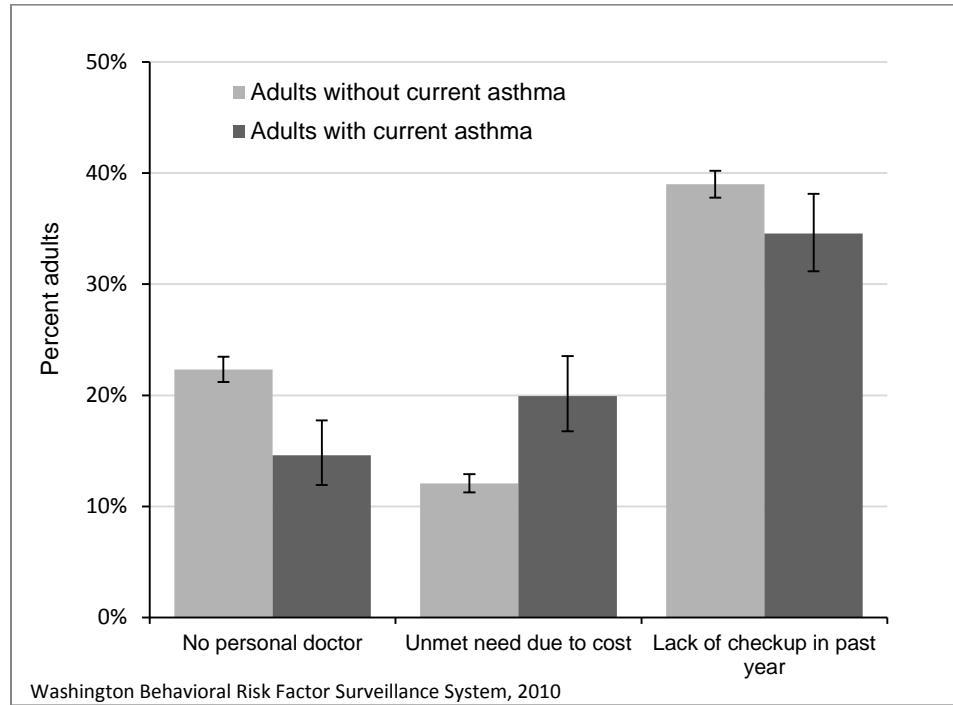
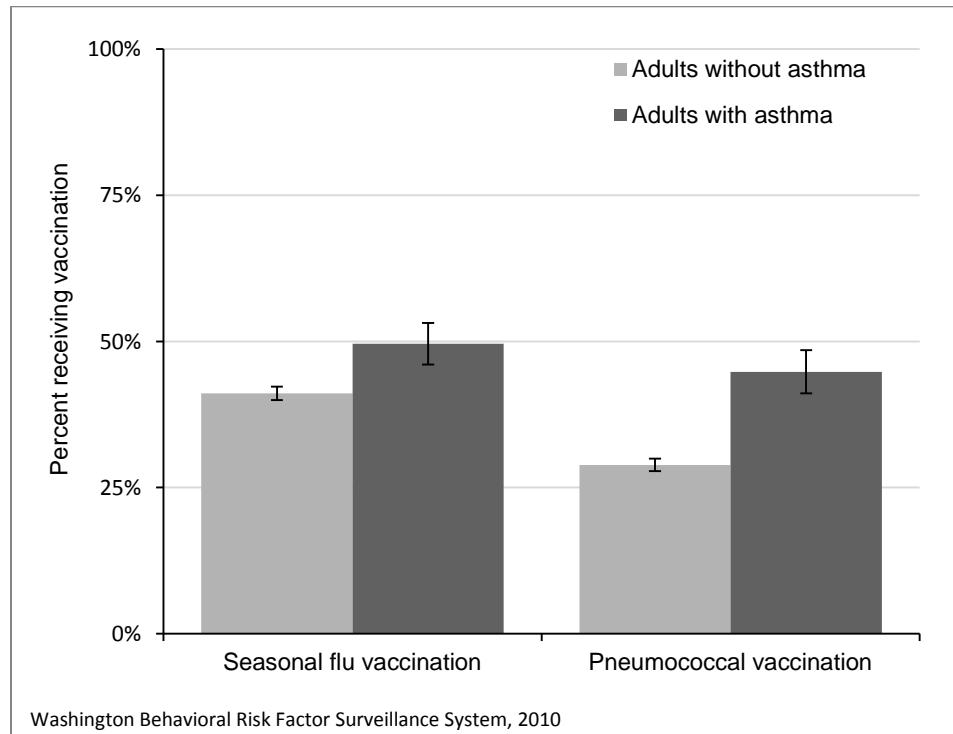


Figure 31. Vaccinations among adults with or without asthma, 2010



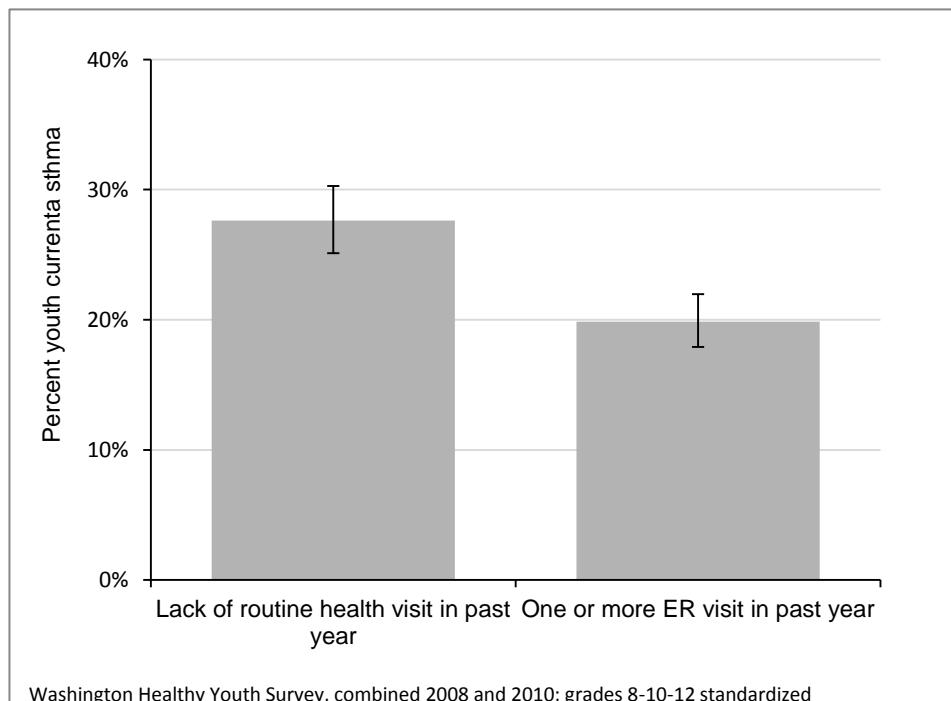
KEY FINDINGS

Access to a healthcare provider is needed for effective clinical management of asthma.

- Fewer adults with asthma report not having a personal doctor (15 percent) and not visiting a doctor for a routine checkup (35 percent) in the past year compared to the adults without asthma (22 percent and 39 percent). This suggests that most people with asthma have identified a place to go for their healthcare needs [Fig. 30].
- An individual may not be able to access their provider as often as needed because of financial barriers. For adults with asthma, the prevalence of unmet healthcare needs due to cost (20 percent) was higher than for adults without asthma (12 percent) [Fig. 30].
- The National Asthma Education and Prevention Program guidelines for management of asthma recommend people with asthma receive preventative vaccines. Respiratory infections can be worse for people with asthma and cause an increase in asthma symptoms.⁴¹
- About half of adults with asthma report receiving vaccination for seasonal influenza (50 percent) and pneumococcal (45 percent) [Fig. 30]. Adults with asthma are more likely than adults without asthma to have had these vaccinations [Fig 31].



Figure 32. Asthma health care utilization among youth with current asthma, 2008 and 2010



KEY FINDINGS

Routine care and education for youth living with asthma is important to help them achieve and maintain control of their asthma.

- Twenty eight percent of youth with asthma lack routine healthcare visits in the past year [Fig. 32].
- One in five youth with asthma visited an emergency room in the past year [Fig. 32].

Figure 33. Perceived poor health and activity limitations among adults with or without asthma, 2010

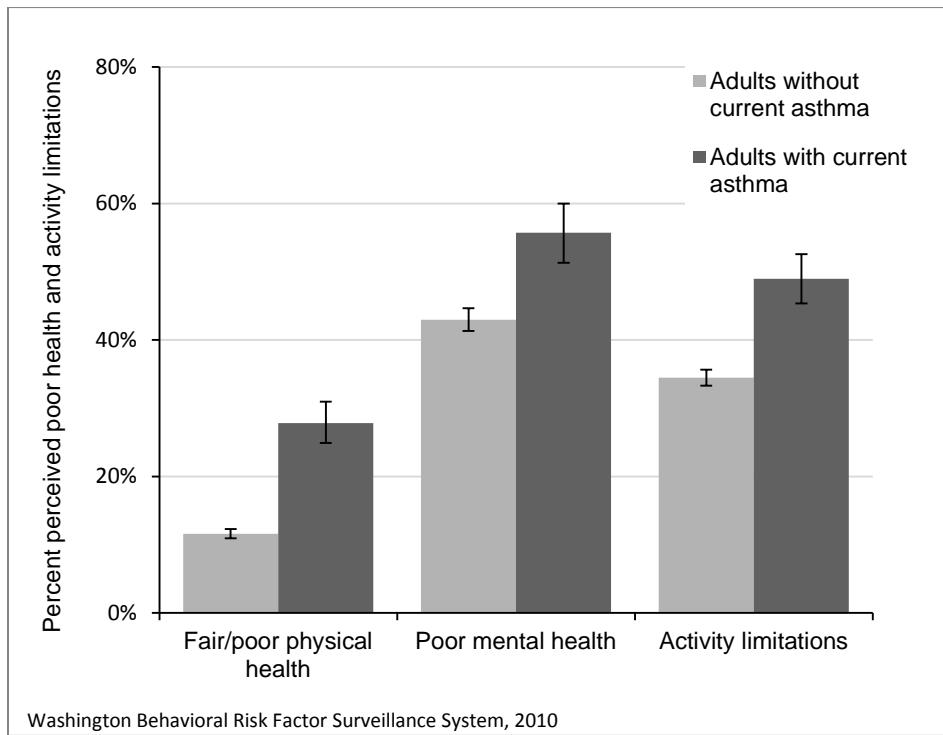
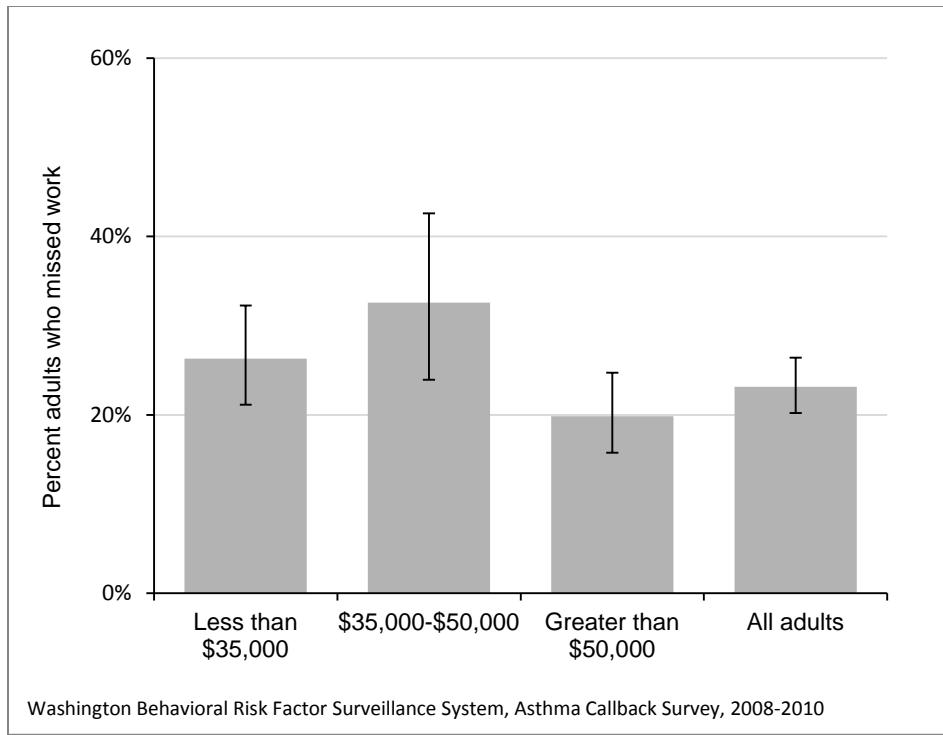


Figure 34. Adults with current asthma who missed one or more days of work or other activities because of asthma in the past 12 months, by household income, 2008-2010



KEY FINDINGS

Constant struggle with asthma symptoms and consequent disruption of normal activities can contribute to decreased overall quality of life for people with asthma.

- Compared to adults without asthma, adults with asthma are more likely to:
 - Describe their health status as "fair" or "poor."
 - Experience mental health issues (including stress, depression, and problems with emotions) in the past month
 - Have activity limitations in the past month because of their health [Fig. 33].
- Missing work or daily activities decreases the quality of life and productivity of people with asthma. Nearly one in four adults with asthma report having missed work or other activities due to their asthma in the last year [Fig. 34].
- Adults with an annual household income of greater than \$50,000 per year are less likely to report missing work or other usual activities than those with lower incomes [Fig. 34].

Figure 35. Sleep disturbances due to asthma in the past 30 days among adults with asthma, 2008-2010

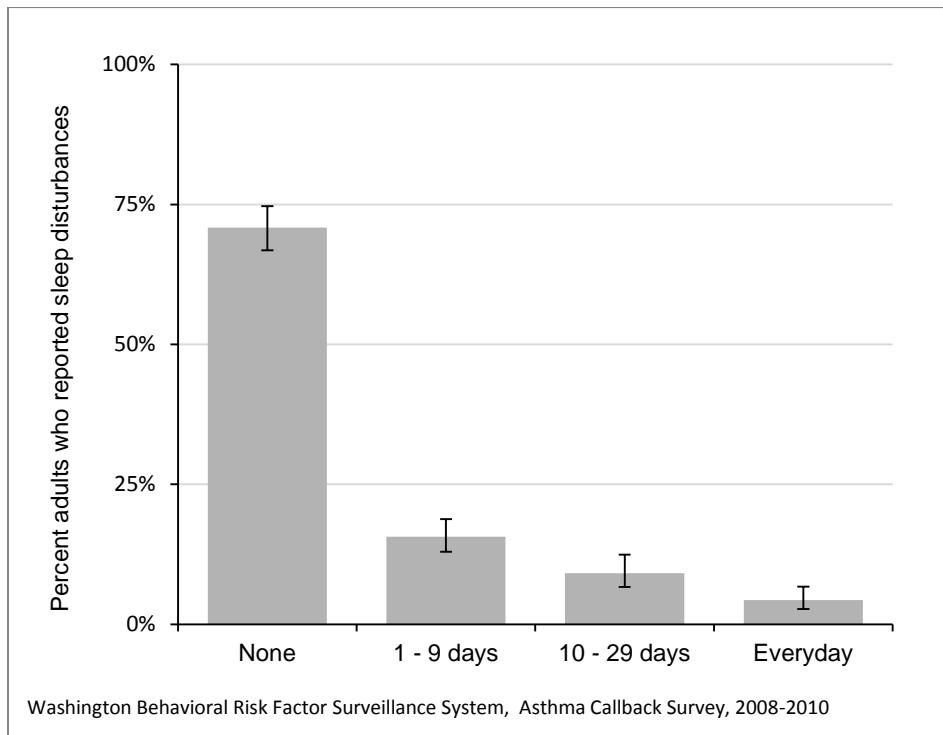
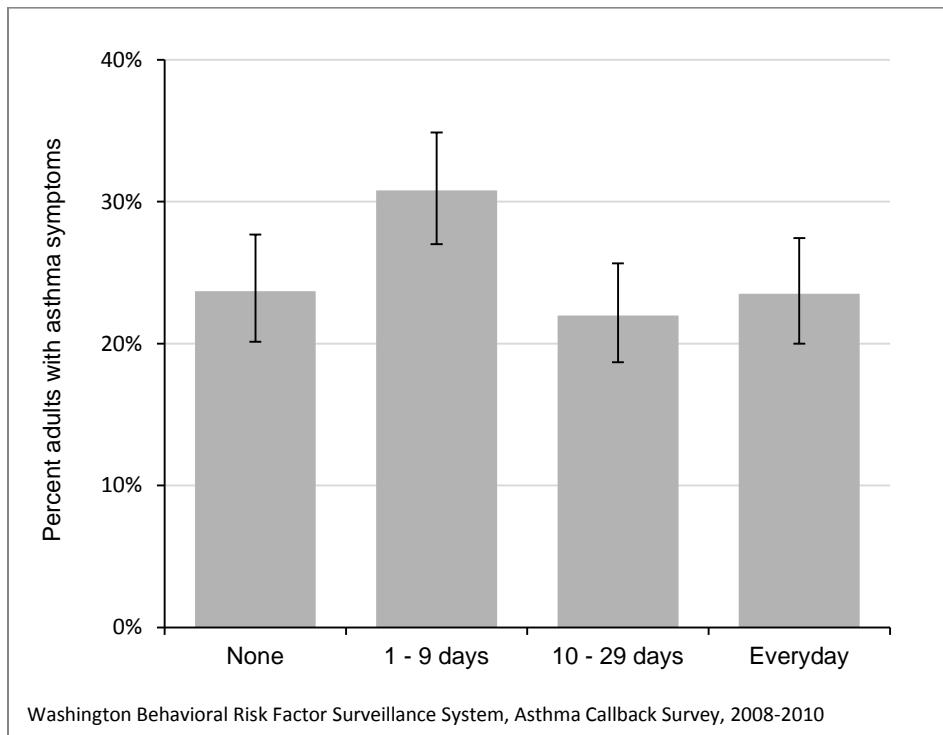


Figure 36. Frequency of asthma symptoms in the past 30 days among adults with asthma, 2008-2010

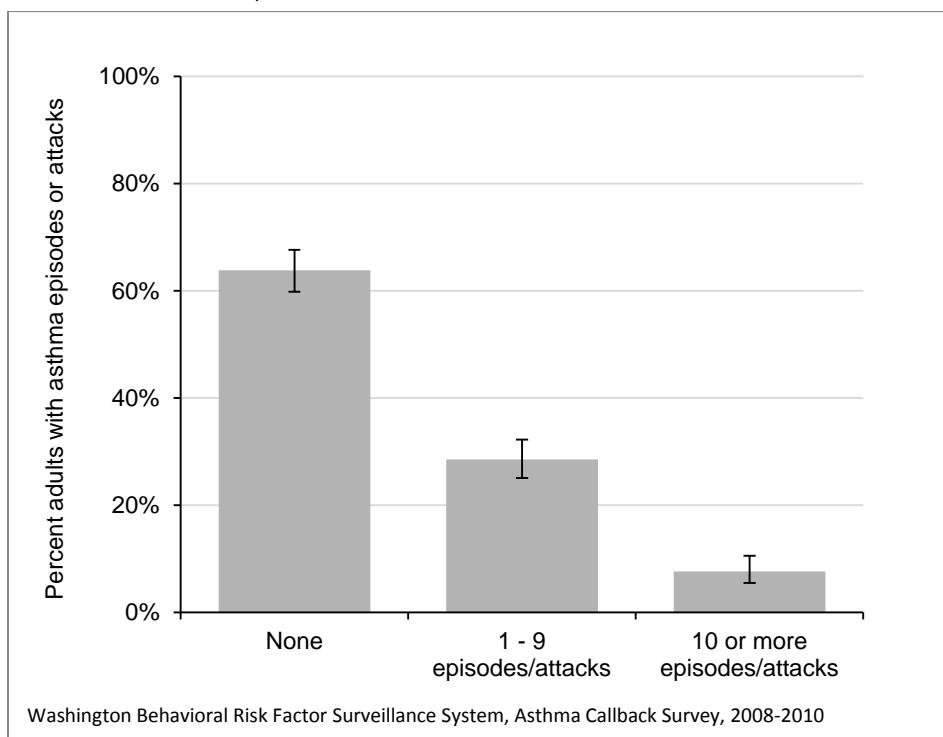


KEY FINDINGS

People with asthma can experience frequent symptoms every day and may have sleep disruption due to their asthma symptoms, which can result in poor mental and physical function.

- Nearly a third of adults with asthma (29 percent) report having one or more nights when their asthma symptoms made it difficult to sleep. Almost five percent report having sleep disruptions everyday in the past month [Fig. 35].
- Over three quarters of adults with asthma (76 percent) experienced asthma symptoms in the past month; almost 25 percent experience asthma symptoms every day [Fig. 36].

Figure 37. Frequency of asthma episodes or attacks in the past 3 months among adults with asthma, 2008-2010



KEY FINDINGS

- More than a third of adults with asthma (36 percent) report having at least one asthma episode or attack in the last three months, with most having between one and nine episodes or attacks [Fig. 37].
- In general, youth with current asthma suffer from more depression and suicidal thoughts than youth without current asthma. About 35 percent of youth with asthma report being depressed and 19 percent report “seriously thinking” about suicide during the previous year [Fig. 38].

Figure 38. Prevalence of depression and suicidal thoughts among youth with or without asthma, 2008 and 2010

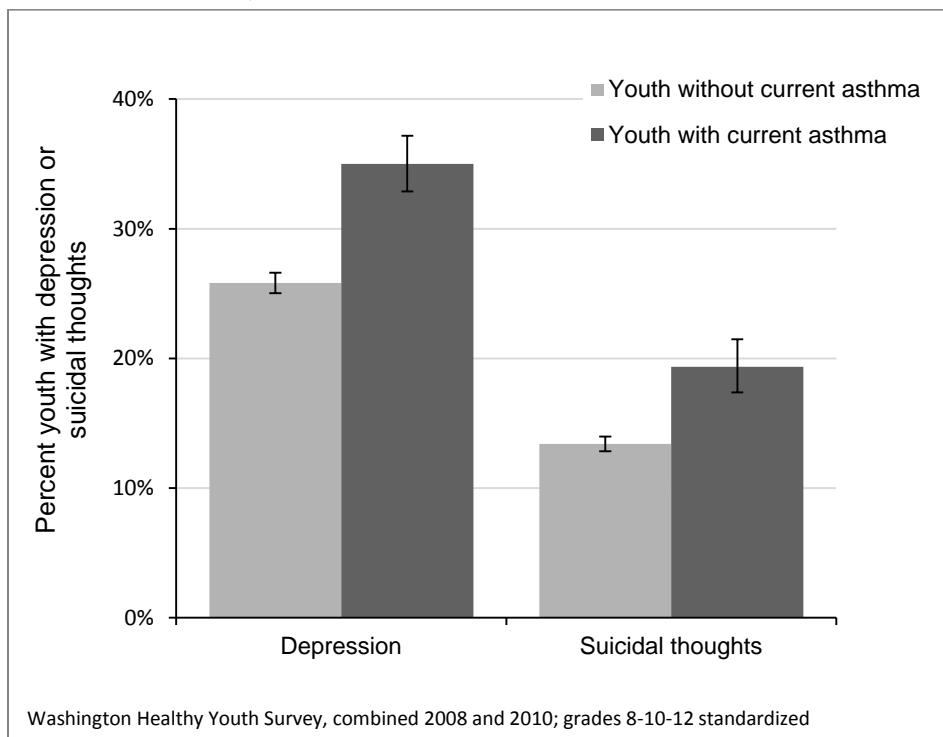
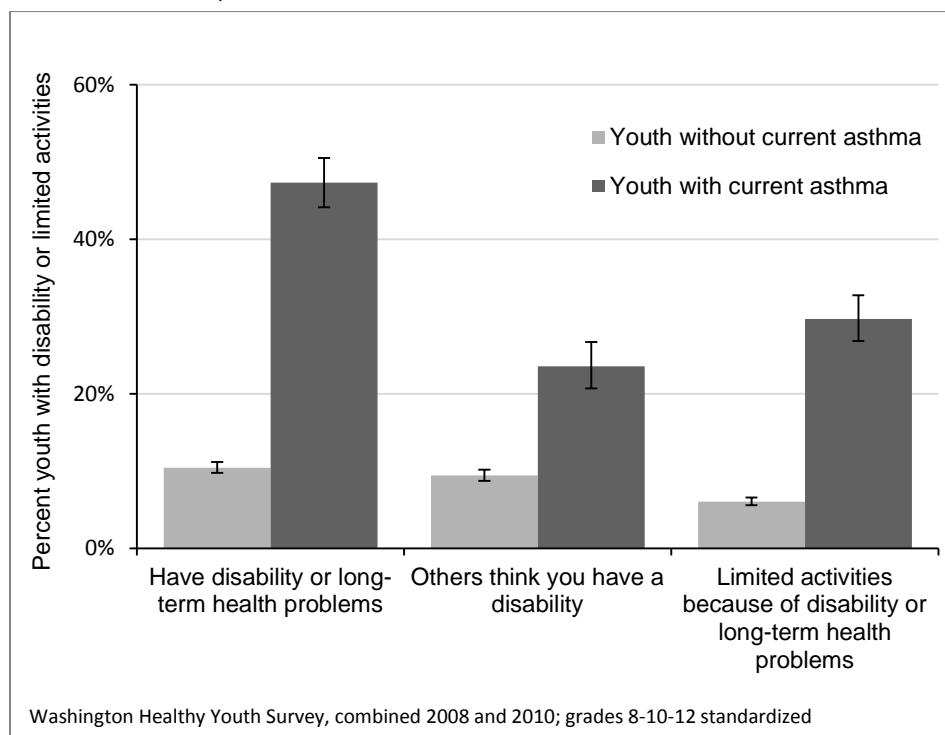


Figure 39. Prevalence of disability and limited activities among youth with or without asthma, 2008 and 2010



KEY FINDINGS

- Youth with asthma are more than four times (47 percent) as likely as youth without asthma (11 percent) to report having a long-term disability or long-term health problem. About one in three youth report they had to limit their activities because of their disability or long-term health condition [Fig. 39].
- About three quarters of youth with asthma reported having symptoms on one or more days per week in the past month, with one in eight experiencing daily symptoms [Fig. 40].

Figure 40. Frequency of asthma symptoms in the past month among youth with asthma, 2010

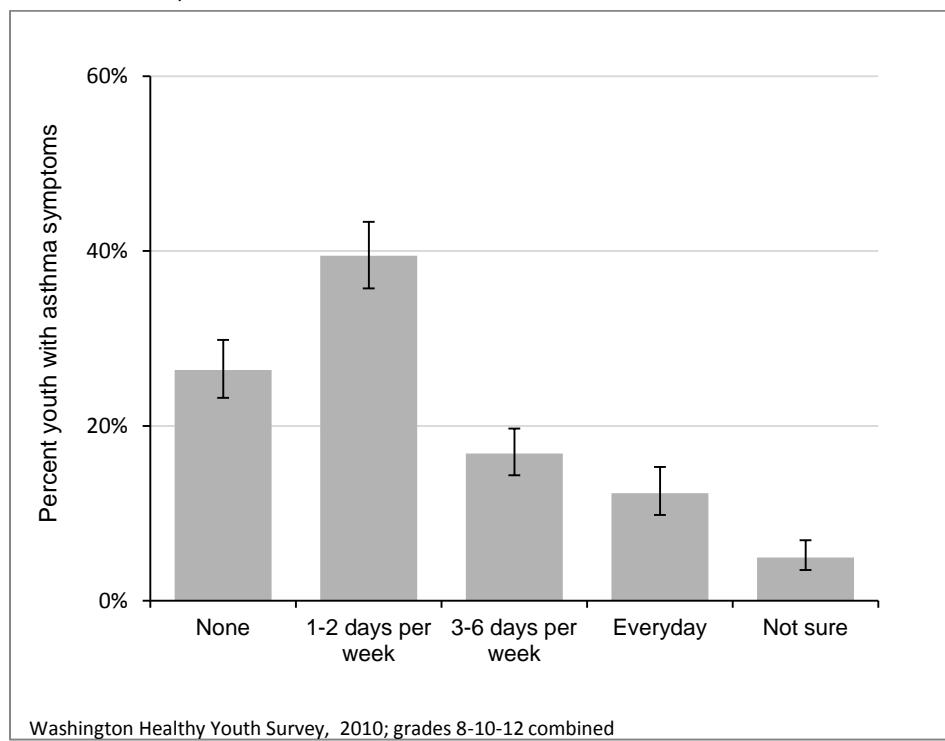
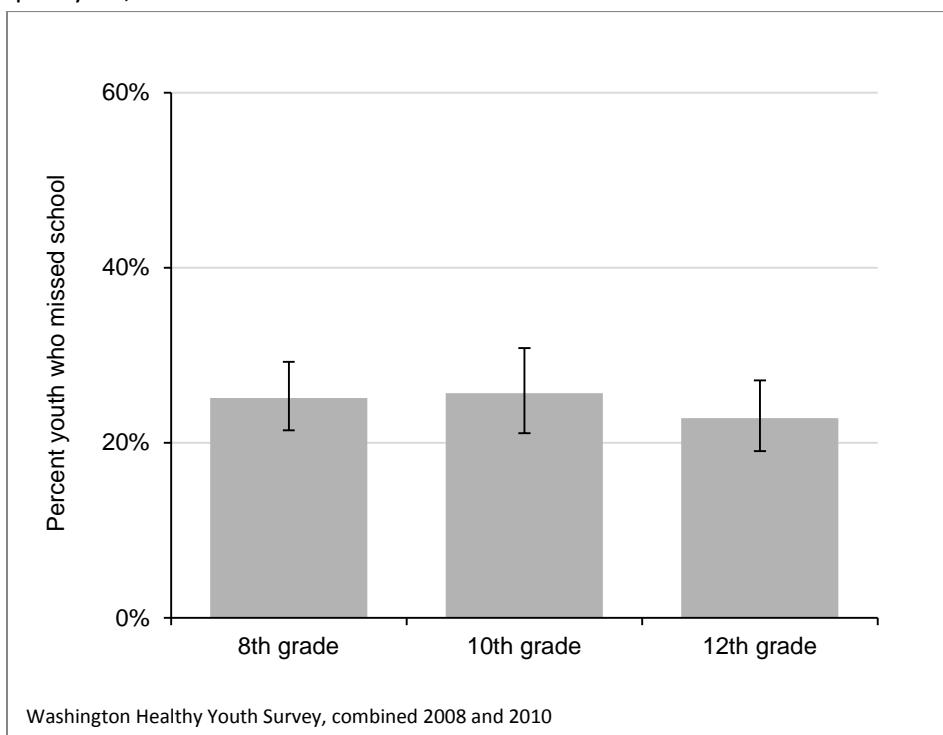


Figure 41. Percent of youth who missed school because of asthma during the past year, 2008 and 2010

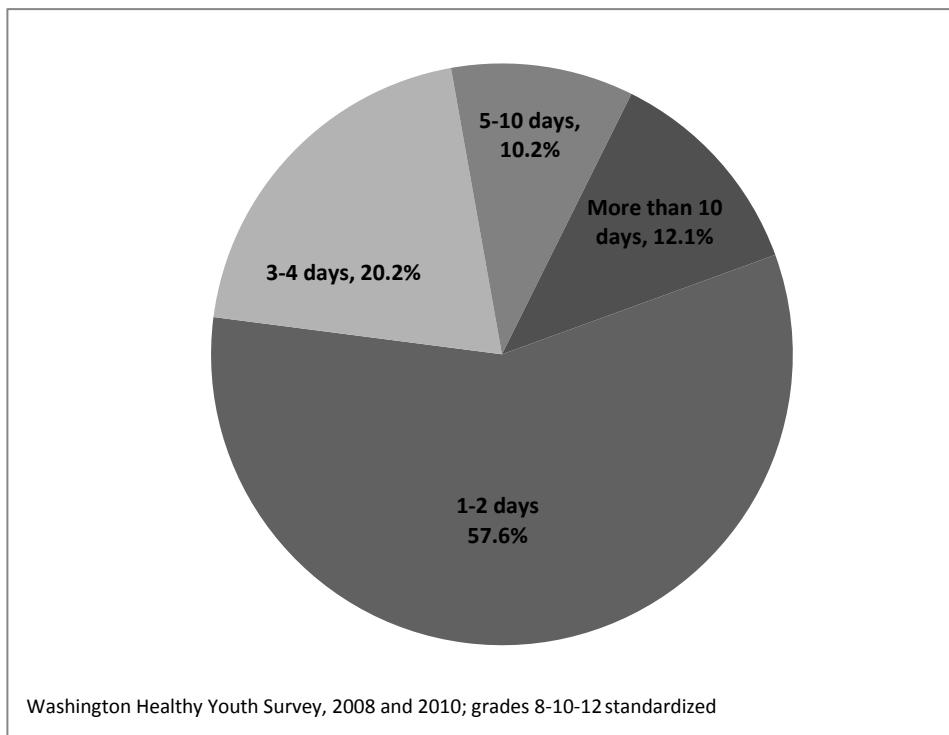


KEY FINDINGS

When youth miss school, it may contribute to poor academic performance and social development.

- Nearly one in four youth report missing at least one day of school in the previous year due to their asthma. Asthma related absenteeism is similar across all grade levels [Fig. 41].
- Among youth who had missed any school during the previous year due to their asthma, most (58 percent) only missed one or two days, but about 22 percent missed a week or more [Fig. 42].

Figure 42. Distribution of missed school days during the past year among youth with asthma who missed school, 2008 and 2010



According to the National Hospital Discharge Survey, 2010, there were 429,000 asthma hospitalizations, or 14.2 per 100,000 in the U.S.⁴²

Although asthma hospitalizations are to some extent affected by the percent of people who have asthma, proper asthma care and management can prevent many hospitalizations.⁴³ Information on asthma hospitalizations can aid in identifying groups of people needing better care or help with managing their asthma.

Asthma hospitalizations for Washington residents are monitored through the Comprehensive Hospital Abstract Reporting System (CHARS). CHARS provides information on hospital discharges from all state-licensed acute care hospitals in Washington, except military, Veterans Administration, or psychiatric hospitals.

This dataset includes information on the dates of admission and discharges, principal and additional diagnosis, procedure codes, financial charges, primary payer, and limited patient demographics. Expanded demographics were collected starting in 2009 for race and ethnicity. However, this new demographic information is currently undergoing quality checks and is not reported here. Data on race and ethnicity will be included in future burden reports.

An asthma hospitalization is defined as having a primary diagnosis with an International Classification Disease 9th Revision Clinical Modification (ICD-9-CM) code of 493. People who are not Washington residents are excluded from analysis. Some Washington residents hospitalized in Oregon and neighboring states are included in this analysis. Hospitalization rates are age-standardized to the U.S. 2000 standard population where noted.



Figure 43. Asthma hospital discharge rates: Washington and U.S., 2000-2010

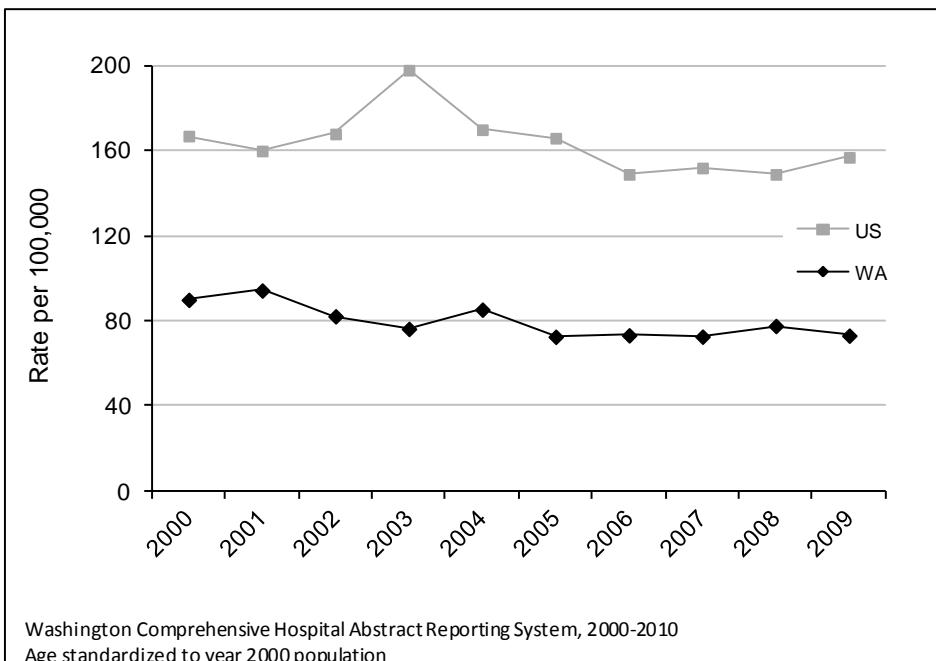
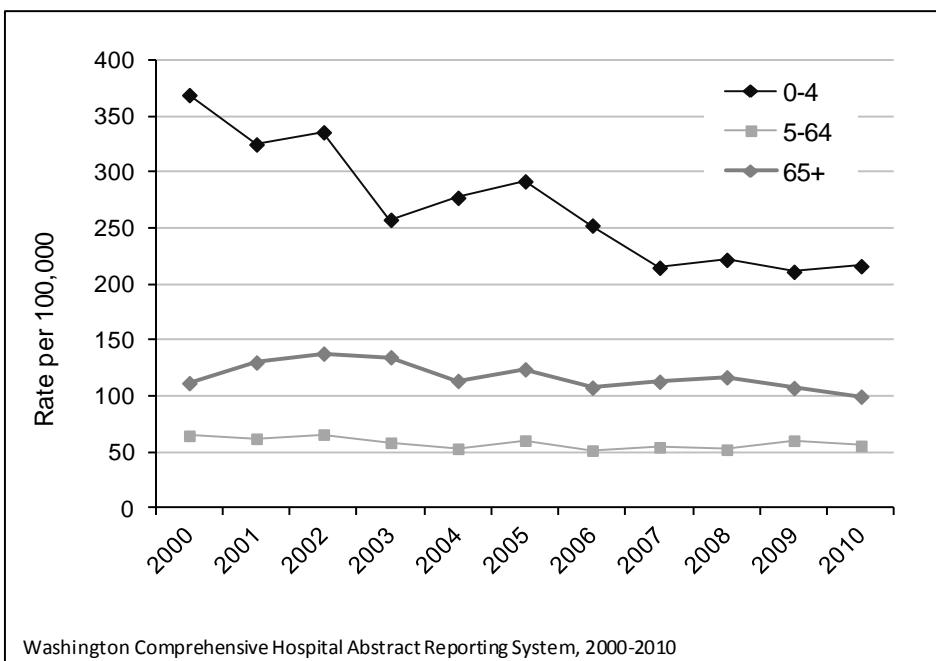


Figure 44. Asthma hospital discharge rates by age groups, 2000-2010

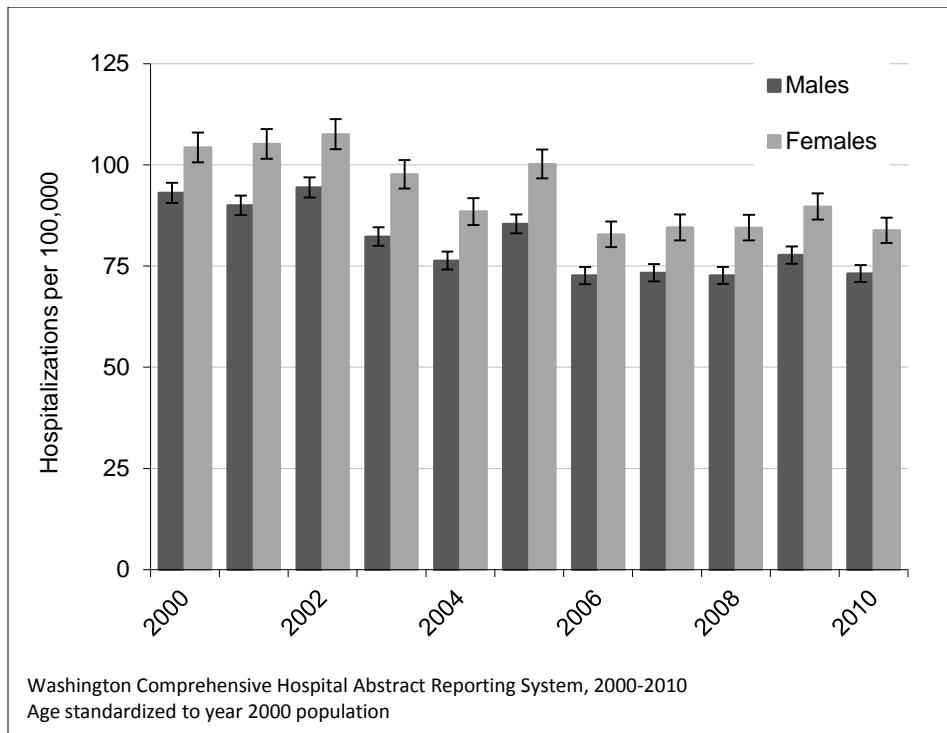


KEY FINDINGS

Asthma hospitalizations are often preventable for people who manage their symptoms properly and receive appropriate care.

- Washington's hospitalization rate has been consistently half that of the nation. In 2010, hospitalization rates were 73 per 100,000 residents [Fig. 43]. The reason for this difference is not known.
- Very young children are most likely to be hospitalized for asthma. From 1999 to 2010, children age four and under had the highest asthma hospitalization rate compared to all other age groups [Fig. 44]. The 2010 hospitalization rate for this group is 216 per 100,000.
- From 2000 to 2010, there has been a significant decline in asthma hospitalization rates for children under the age of four, and this could possibly be due to advances in asthma care.
- Asthma is the number one cause of hospitalization for children under 15 years of age in Washington. Nationally, asthma is the third-leading cause of hospitalization for the same age group.⁴⁴

Figure 45. Asthma hospital discharge rates by gender, 2000-2010



KEY FINDINGS

- Females consistently have higher hospitalization rates than males [Fig. 45]. As noted in Figure 4, adult females are more likely to have asthma than adult males.
- Asthma hospitalizations are higher for males ages 0 to 14 years. After age 14, the rate of hospitalizations is higher for females. The 15-24 age group has the lowest asthma hospitalizations rate, with the very young or persons older than 80 years with the highest [Fig. 46]. These trends are similar to national trends.¹¹

Figure 46. Asthma hospital discharge rates by age groups and gender, 2008-2010

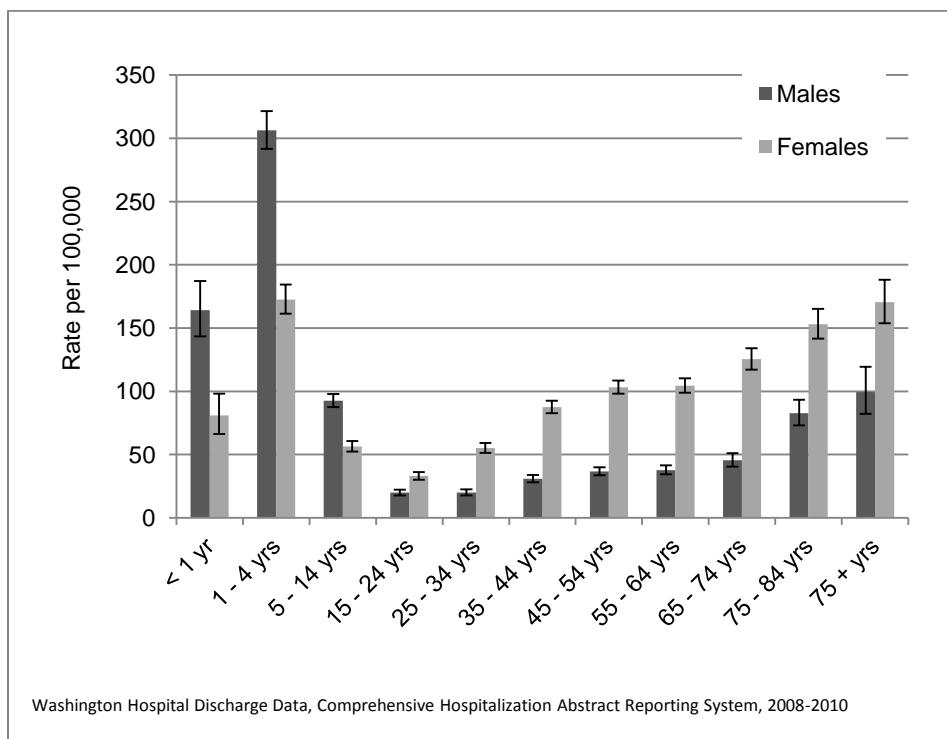
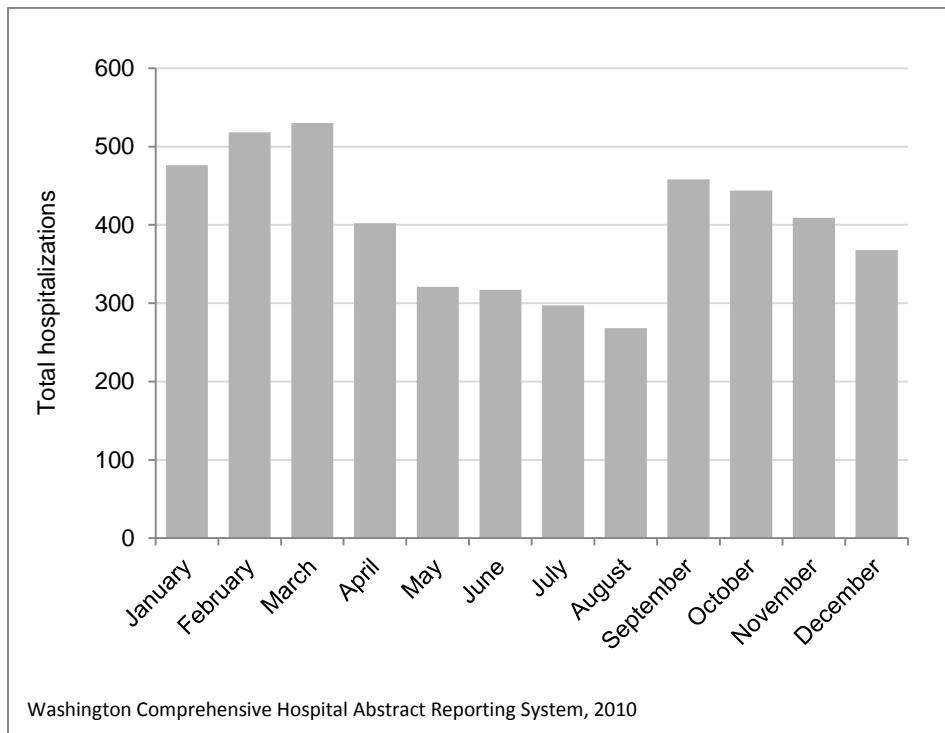
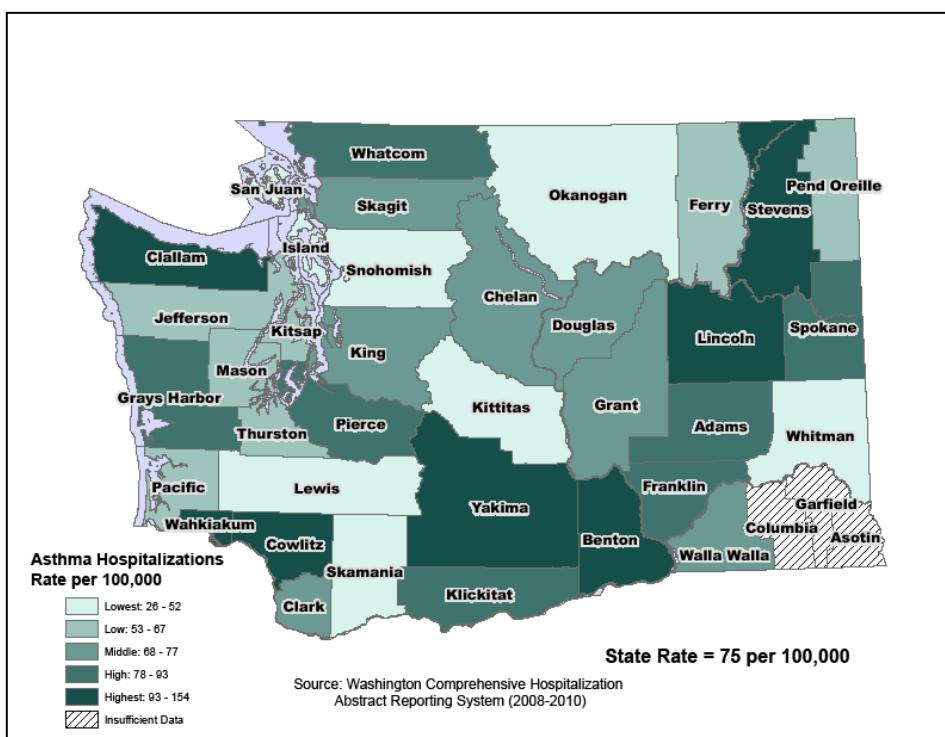


Figure 47. Asthma hospital discharge rates by month, 2010



Map 8. Asthma hospital discharge rates by county, 2008-2010



KEY FINDINGS

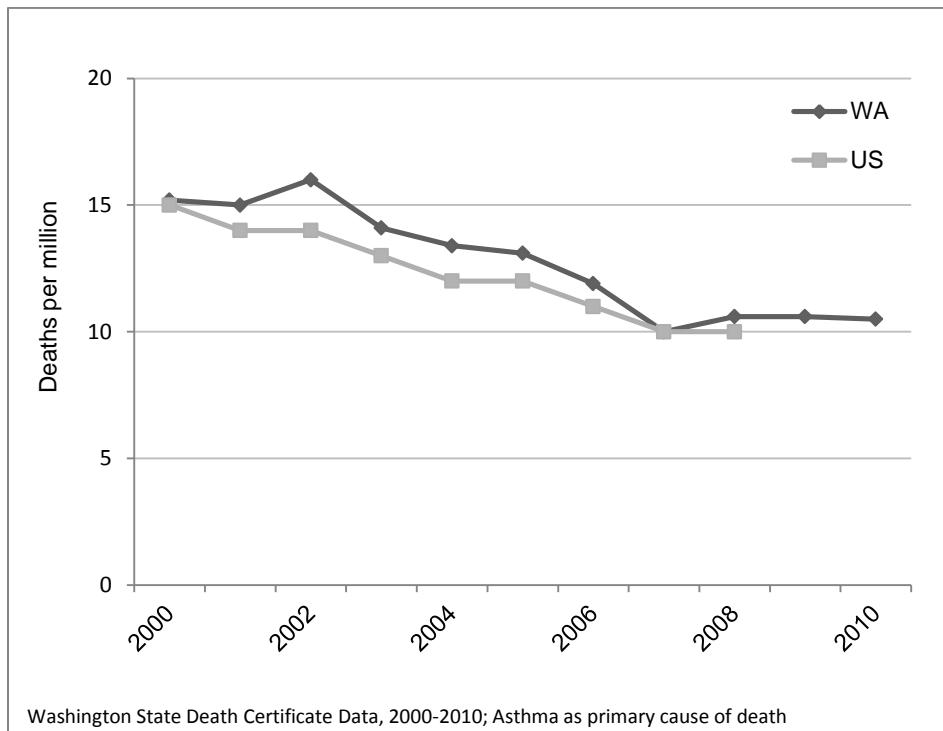
- Asthma hospitalizations are highest during fall and winter months [Fig. 47]. The period with the fewest hospitalizations is summer. Large fall and spring peaks may be related to exposure to allergens, increased use of woodstoves, changes in temperature, and increased respiratory infections related to children going back to school.⁴⁵
- Washington hospitalization data do not include information on race, ethnicity and income. Studies in other states have shown hospitalizations to be higher among blacks and people of Hispanic origin compared to whites,^{46,47} and among people with low incomes compared to people with higher incomes.⁴⁸ These patterns may be true in Washington as well.
- Asthma hospitalization rates appear to vary across the state with no clear sign of high rates in any geographical cluster [Map 8].

Compared to hospitalizations, there are few deaths due to asthma and the number of those deaths have been declining since 1990, most likely in response to successful clinical practice improvements.⁴⁹ Although asthma is a chronic disease, with proper management people with asthma can lead healthy lives with few limitations in their activities and without experiencing life-threatening episodes. In 2008 nearly 3,400 people nationwide died as a result of asthma, a rate of about 11 deaths per million U.S. residents.⁵⁰

Asthma death is monitored through Washington's Death Certificate System which gathers information about each death that occurs in Washington State. Similar information is collected for residents of Washington State who die in another state or country. An asthma death is defined as having asthma listed as the underlying (principal) cause of death. When possible, the death rates have been age-standardized to the U.S. 2000 standard population. National rates were obtained from the Centers for Disease Control and prevention (CDC) Wide-ranging Online Data for Epidemiologic Research (WONDER) data system at <http://wonder.cdc.gov>.



Figure 48. Asthma death rates: Washington and U.S., 2000-2010



KEY FINDINGS

- There were 74 deaths attributed to asthma in 2010. Washington's asthma death rates have declined from 15 per one million in 2000 to 11 per one million residents in 2010, similar to the national rate [Fig. 48].⁵⁰
- Females are consistently more likely to die from asthma than males in Washington [Fig. 49]. This is similar to the national mortality trend.⁵⁰

Figure 49. Asthma death rates by gender, 2000-2010

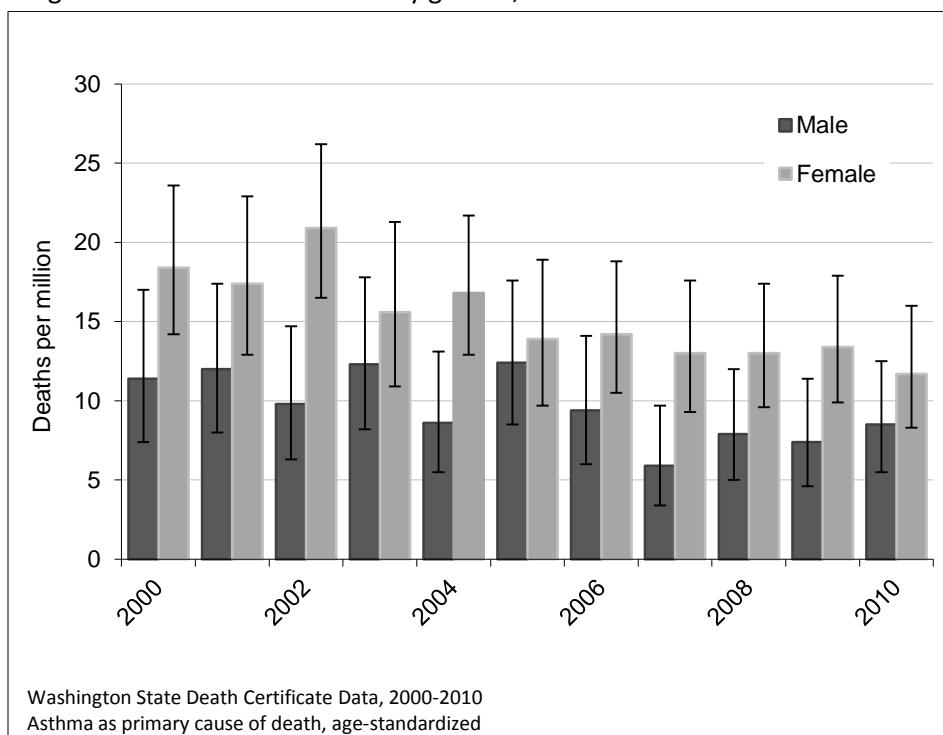


Figure 50. Asthma death rates by age groups, 2010

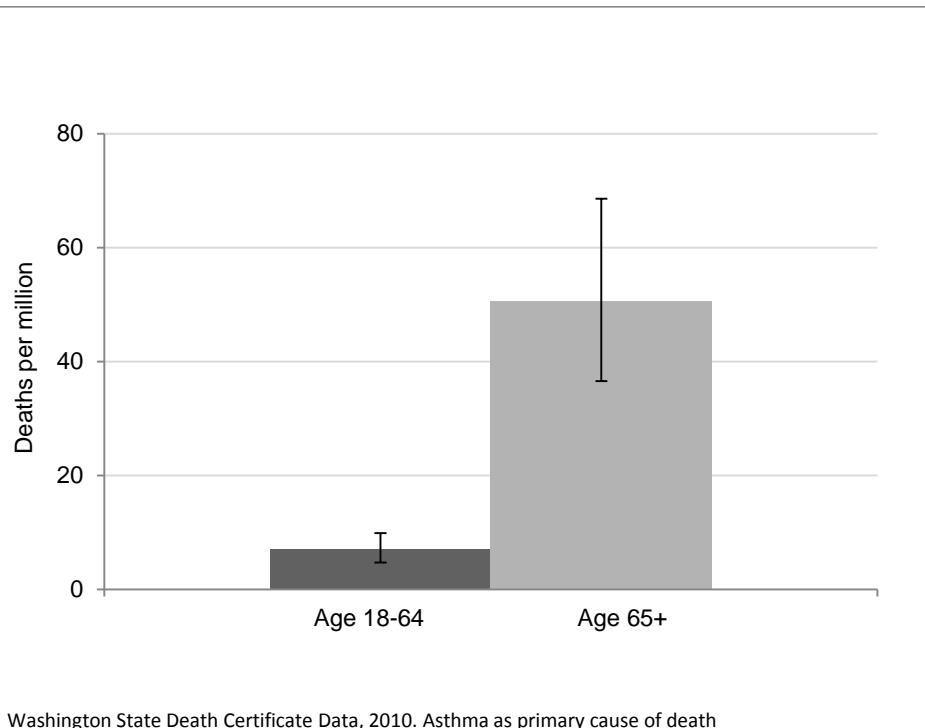
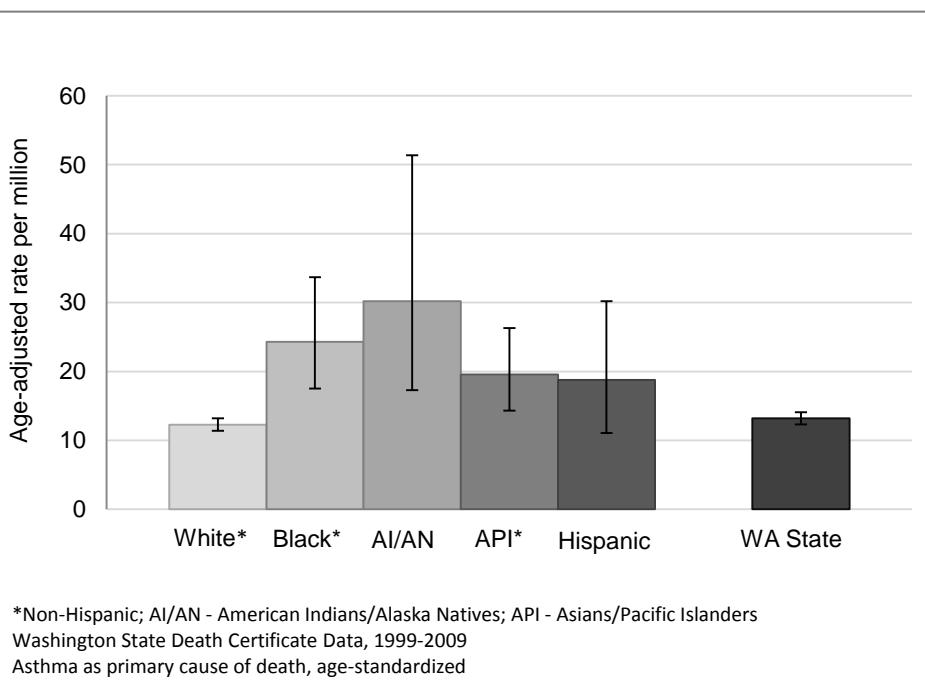


Figure 51. Asthma death rates by race/ethnicity, 1999-2009



KEY FINDINGS

- Based on 2010 data, adult Washington residents ages 65 or older were significantly more likely to die from asthma than those aged 18 to 64. No Washington residents younger than 18 years of age died from asthma within the year [Fig. 50].
- For meaningful estimates of asthma deaths by race and ethnicity in Washington, Death Certificate data were combined from the past decade. The accuracy of mortality rates depend on the consistency of information collected through the Death Certificate System. Reporting of race or Hispanic origin on death certificates is sometimes based on observing the decedent rather than questioning the next of kin. This procedure causes an underestimation of deaths for certain groups, particularly American Indians/Alaska Natives, some Asian subgroups, and Hispanics.⁵¹
- Despite the possibility of under reporting, data show that Black, American Indian/Alaska Native, and Asian/Pacific Islander individuals have higher death from asthma rates than whites [Fig. 51].

Addressing risk factors. Data suggest a need to educate adults with asthma and their families about the risks of smoking in the home. Smoking prevention, avoiding secondhand smoke and cessation services are also needed to reduce exposure to tobacco smoke among people with asthma and during pregnancy.

Improving the quality of medical care. Health care providers should assess asthma patients for coexisting health conditions that are higher among people with asthma, including diabetes, hypertension, and mental health concerns. These conditions can make it harder for an individual with asthma to effectively manage their disease. Only about two thirds of adults with asthma, and just under three fourths of youth with asthma receive regular checkups as recommended in the national guidelines. Health care providers should schedule planned visits (every one to six months) for their asthma patients. Written asthma action plans should be provided to everyone with asthma; only about one quarter of adults and one third of youth have received a written plan from their health care provider.

Increasing the availability of asthma education. Asthma is a chronic condition that requires daily self care. Education is an important part of learning the necessary self-management skills. Good asthma education includes basic facts about asthma, understanding different medications and how to take them correctly, avoiding asthma triggers, monitoring symptoms, using an asthma action plan, and knowing when to seek medical care. Most people with asthma do not receive all of the recommended components of good self-management education.

Taking a closer look at disparities. AI/AN in Washington bear a dramatically higher burden of asthma than the general population. AI/AN have a higher prevalence of asthma at every income level. They also experience higher prevalence of comorbidities and some risk factors, and worse outcomes. Asthma unequally impacts AI/ANs' quality of life and can be life-threatening. Most disturbing is an asthma death rate that is twice that of the general population.

There is some good news. Our data show that AI/ANs with asthma are more likely to be taught how to use a peak flow meter and receive pneumonia vaccination, as recommended in the national asthma management guidelines. They also seem to be exposed to fewer home environmental triggers from wood heating and gas stoves.

Future direction. Asthma is controllable, and resources should be focused on reducing asthma inequities for high-risk groups. Through collaboration with the Washington Asthma Initiative, the Washington State Department of Health released the *Washington State Asthma Plan 2011-2015* as a blueprint for taking action. This revised plan reflects the needs of Washington's residents and sets a direction for addressing asthma inequities by outlining priority goals and objectives. DOH is working with partners to implement the plan using coordinated, culturally appropriate strategies and cross-cultural education. These approaches emphasize developing policies in schools, communities, and health care settings to support good asthma management.

These are only a few of the many activities in our state that address asthma. This work focuses on multiple stakeholders and the need for socially and culturally tailored solutions depending on the particular health issue and the populations involved. We hope that the data outlined in this report will help catalyze improvement efforts for people with asthma and their communities in Washington State.

WHAT IS ASTHMA?

1. Asthma hospitalization charges in Washington, 2010

WHO HAS ASTHMA?

2. Adults with current asthma: Washington and U.S., 1999-2010
3. Adults with asthma, 2010
4. Adults with current asthma by age and sex, 2008-2010
5. Adults with current asthma by race and Hispanic ethnicity, 2008-2010
6. Adults with current asthma by sexual orientation, 2008-2010
7. Adults with current asthma by educational attainment, 2008-2010
8. Adults with current asthma by annual household income, 2008-2010
9. Adults with current asthma by current type of health insurance, 2008-2010
10. Adults with current asthma who report having other chronic conditions, 2008-2010
- Map 1. Adults with current asthma by county, 2008-2010
11. Children with asthma by adult proxy, 2009-2010
12. Children with current asthma by adult proxy, by sex, 2009-2010
13. Children with current asthma by adult proxy, by age and sex, 2009-2010
14. Youth with lifetime asthma: Washington and U.S., 2002-2010
15. Youth with asthma by grade, 2010
16. Youth with current asthma by grade and sex, 2010
17. Youth with current asthma by race and Hispanic ethnicity, 2008 and 2010
18. Youth with current asthma by maternal educational attainment, 2008 and 2010
- Map 2. Youth with current asthma by county, 2008 and 2010

ASTHMA RISK FACTORS

19. Adults with current asthma by smoking status, 2008-2010
20. Current smoker among adults with or without asthma, 2008-2010
- Map 3. Adult cigarette use by county, 2008-2010
21. Youth with current asthma by smoking status and gender, 2008 and 2010
- Map 4. Youth cigarette use by county, 2008 and 2010
22. Lifetime and current asthma among adults by exposure to second hand smoke in the home, 2008-2010
23. Adults with current asthma by BMI status and gender, 2010
- Map 5. Adult obesity by county, 2008-2010
24. Youth with current asthma by BMI status and gender, 2008 and 2010
- Map 6. Youth obesity by county, 2008 and 2010
- Table 1. Indoor air exposures that cause or trigger asthma
- Table 2. Indoor asthma triggers and actions to reduce risk among adult and children with asthma
25. Adults who reported their asthma had been caused by or made worse by the work environment by asthma status, 2008-2010
- Table 3. Indoor air policies or practices by business type, 2008
- Table 4. Outdoor air exposures that cause or trigger asthma
- Map 7. Washington State number of days PM_{2.5} levels were higher than Washington Air Quality Advisory standard by county, 2010

LIVING WITH ASTHMA

26. Asthma self-management and education among adults with current asthma, 2008-2010
27. Use of complementary medication among adults with current asthma, 2008-2010
28. Washington youth with asthma who have a written asthma plan, 2008 and 2010
29. Frequency rescue inhaler use in past month among youth with asthma, 2010
30. Access to health care among adults with or without asthma, 2010
31. Vaccinations among adults with or without asthma, 2010
32. Asthma healthcare utilization among youth with current asthma, 2008 and 2010
33. Perceived poor health and activity limitations among adults with or without asthma, 2010
34. Adults with current asthma who missed one or more days of work or daily activities because of asthma in the past 3 months, by household income
35. Sleep disturbances due to asthma in the past 30 days among adults with current asthma
36. Frequency of asthma symptoms in the past 30 days among adults with current asthma
37. Frequency of asthma episodes or attacks in the past 3 month among adults with current asthma
38. Prevalence of depression and suicidal thoughts among youth with or without asthma, 2008 and 2010
39. Prevalence of disability and limited activities among youth with or without asthma, 2008 and 2010
40. Frequency of asthma symptoms in past month among youth with current asthma, 2010
41. Percent of youth who missed school because of asthma during the past year, 2008 and 2010
42. Distribution of days youth missed school during the past year among youth with asthma who missed any school, 2008 and 2010

ASTHMA HOSPITALIZATION

43. Asthma hospital discharge rates: Washington and U.S., 2000-2010
44. Asthma hospital discharge rates by age groups, 2000-2010
45. Asthma hospital discharge rates by gender, 2000- 2010
46. Asthma hospital discharge rates by age groups and gender, 2010
47. Asthma hospital discharges by month, 2010
- Map 8. Asthma hospital discharge rates by county, 2008-2010

ASTHMA DEATHS

48. Asthma death rates: Washington and U.S., 2000-2010
49. Asthma death rates by gender, 2010
50. Asthma death rates by age groups, 2010
51. Asthma death rates by race, 1999-2009

Data table for Figure 1. Asthma hospitalization charges in Washington, 2010: Comprehensive Hospital Abstract Reporting System (CHARS), 2010

Payer	Millions	Percent
Medicaid	\$21.8	30%
Medicare	\$21.3	29%
Health Care Service Contractor	\$9.4	13%
Commercial Insurance	\$8.0	11%
HMO	\$5.3	7%
Self Pay	\$4.8	7%
Other	\$2.7	4%
Total	\$73.3	100%

Data table for Figure 2. Adults with current asthma: Washington and U.S, 1999-2010

Year	Washington	95% CI	US	95% CI
1999	7.0%	(6.2% , 7.0%)		
2000	8.2%	(7.3% , 9.2%)	7.2%	(7.0% , 7.4%)
2001	7.6%	(6.8% , 8.5%)	7.2%	(7.0% , 7.4%)
2002	8.9%	(7.9% , 9.9%)	7.5%	(7.3% , 7.7%)
2003	9.0%	(8.5% , 9.5%)	7.7%	(7.5% , 7.9%)
2004	9.1%	(8.6% , 9.7%)	8.1%	(7.9% , 8.3%)
2010	9.6%	(8.9% , 10.2%)	8.7%	(8.5% , 8.8%)

Data table for Figure 3. Adults with asthma, 2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

	Current Asthma	95% CI	Lifetime, not current Asthma	95% CI	Never Had Asthma	95% CI
Asthma Status Among Adults	9.6%	(8.9% , 10.2%)	5.7%	(5.2% , 6.3%)	84.7%	(83.9% , 85.5%)

Data table for Figure 4. Adults with current asthma by age and sex, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

	Asthma Men	95% CI	Asthma Women	95% CI	Asthma Combined	95% CI
Age 18 – 24	6.5%	(4.8% , 8.8%)	12.8%	(10.5% , 15.6%)	9.6%	(8.1% , 11.3%)
Age 25 – 34	7.0%	(5.7% , 8.6%)	9.6%	(8.3% , 11.0%)	8.3%	(7.3% , 9.3%)
Age 35 – 44	6.5%	(5.5% , 7.6%)	11.6%	(10.6% , 12.7%)	9.0%	(8.3% , 9.8%)
Age 45 – 54	7.5%	(6.6% , 8.5%)	11.7%	(10.8% , 12.6%)	9.6%	(9.0% , 10.3%)
Age 55 – 64	7.6%	(6.9% , 8.5%)	12.7%	(11.9% , 13.6%)	10.2%	(9.6% , 10.8%)
Age 65 – 74	7.0%	(6.2% , 8.0%)	12.2%	(11.2% , 13.2%)	9.7%	(9.1% , 10.4%)
Age 75+	6.9%	(5.8% , 8.1%)	8.6%	(7.7% , 9.6%)	7.9%	(7.2% , 8.7%)
Total	7.0%	(6.6% , 7.5%)	11.4%	(10.9% , 11.9%)	9.2%	(8.9% , 9.6%)

Data table for Figure 5. Adults with current asthma by race and Hispanic ethnicity, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010.

	Asthma	95% CI
White	9.4%	(9.0% , 9.8%)
Black	11.6%	(9.2% , 14.6%)
Asian	5.0%	(3.8% , 6.7%)
Pacific Islander	9.0%	(5.8% , 13.7%)
Native American	17.9%	(14.8% , 21.5%)

Hispanic (any race)	7.6%	(6.5% , 9.0%)
English-speaking Hispanic	10.5%	(8.7% , 12.7%)
Spanish-speaking Hispanic	3.8%	(2.4% , 6.1%)

Data table for Figure 6. Adults with current asthma by sexual orientation, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

% current asthma	Total	95% CI	Men only	95% CI	Women only	95% CI
Heterosexual/ Straight	9.1%	(8.7% , 9.4%)	6.9%	(6.4% , 7.4%)	11.2%	(10.7% , 11.8%)
Lesbian, Gay, or Bisexual	13.6%	(11.4% , 16.3%)	11.5%	(8.2% , 15.9%)	15.4%	(12.5% , 30.2%)
Total	9.2%	(8.9% , 9.6%)	7.1%	(6.6% , 7.6%)	11.4%	(10.9% , 11.9%)

Data table for Figure 7. Adults with current asthma by educational attainment, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

	Asthma	95% CI
Some High School	10.1%	(8.9% , 11.5%)
High School Grad/ GED	9.1%	(8.4% , 9.8%)
Some College	10.8%	(10.1% , 11.5%)
College Grad	7.9%	(7.4% , 8.4%)
Total	9.1%	(8.8% , 9.5%)

Data table for Figure 8. Adult with current asthma by annual household income, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

	Asthma	95% CI
<\$15,000	17.9%	(16.0% , 19.9%)
\$15,000 -\$24,999	11.2%	(10.2% , 12.2%)
\$25,000 - \$34,999	9.3%	(8.2% , 10.6%)
\$35,000 - \$49,999	9.3%	(8.4% , 10.3%)
\$50,000 - \$74,999	9.4%	(8.3% , 10.5%)
\$75,000 or more	7.3%	(6.7% , 8.0%)
Total	9.3%	(8.9% , 9.7%)

Data table for Figure 9. Adult with current asthma by current type of health insurance, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010 *Other include military, TriCare, the VA, or the Indian Health Service

	Asthma	95% CI
Private or Medicare	9.1%	(8.4% , 9.9%)
Medicaid/Medical Assistance/Basic Health	12.7%	(10.6% , 15.2%)
Other	9.9%	(7.7% , 12.7%)
Total	9.4%	(8.8% , 10.1%)

Data table for Figure 10. Adult with current asthma who report having other chronic conditions, 2008-2010: Washington Behavioral Risk Factor Surveillance System, Asthma Callback Surveys, 2008-2010

	Often depressed during past month	95% CI
Chronic Obstructive Pulmonary Disease	10.6%	(9.0% , 12.5%)
Emphysema	6.6%	(5.3% , 8.1%)
Chronic Bronchitis	20.8%	(18.4% , 23.5%)
Depression	31.8%	(28.5% , 35.3%)

Data table for Figure 11. Children with asthma, by adult proxy, 2009-2010: Washington Behavioral Risk Factor Surveillance System, Child Asthma Callback Surveys, 2009-2010

	Current asthma	95% CI	Lifetime, not current asthma	95% CI	Never Had asthma	95% CI
Asthma Status Among Children	6.7%	(6.1% , 7.4%)	4.1%	(3.6% , 4.6%)	89.2%	(88.4% , 89.9%)

Data table for Figure 12. Children with current asthma by adult proxy, by sex, 2009-2010: Washington Behavioral Risk Factor Surveillance System, Child Asthma Callback Surveys, 2009-2010

	Asthma	95% CI
Boys	7.7%	(6.8% , 8.7%)
Girls	5.7%	(5.0% , 6.1%)
Total	6.7%	(6.1% , 7.3%)

Data table for Figure 13. Children with current asthma by adult proxy, by age and sex, 2009-2010: Washington Behavioral Risk Factor Surveillance System, Child Asthma Callback Surveys, 2009-2010

	Boys	95% CI	Girls	95% CI
Age 0 – 4	5.6%	(4.1% , 7.7%)	2.1%	(1.3% , 3.4%)
Age 5 – 9	6.7%	(5.2% , 8.7%)	4.7%	(3.4% , 6.3%)
Age 10 – 11	8.9%	(6.4% , 12.2%)	6.9%	(4.6% , 10.3%)
Age 12 – 14	8.7%	(6.8% , 11.1%)	6.7%	(5.2% , 8.6%)
Age 15 – 17	10.0%	(8.2% , 12.3%)	10.4%	(8.3% , 13.1%)
Total	7.7%	(6.8% , 8.6%)	5.7%	(6.5% , 6.5%)

Data table for Figure 14. Youth with lifetime asthma: Washington, 2002-2010: Washington Healthy Youth Survey, 2010

	WA	95% CI
2002	8.5%	(8.0% , 9.0%)
2004	8.7%	(8.2% , 9.2%)
2006	9.2%	(8.7% , 9.8%)
2008	8.7%	(8.2% , 9.2%)
2010	8.2%	(7.7% , 8.6%)

Data table for Figure 15. Youth with asthma by grade, 2010: Washington Healthy Youth Survey, 2010

	6th grade	95% CI	8th grade	95% CI	10th grade	95% CI	12th grade	95% CI
Lifetime	14.4%	(13.6% , 15.2%)	18.9%	(17.7% , 20.1%)	19.2%	(17.8% , 20.6%)	19.1%	(17.6% , 20.7%)
Current	7.1%	(6.5% , 7.8%)	9.0%	(8.3% , 9.9%)	9.7%	(8.7% , 10.9%)	7.9%	(6.9% , 8.9%)
Probable	7.1%	(6.5% , 7.8%)	11.7%	(10.8% , 12.7%)	12.7%	(11.5% , 14.0%)	10.5%	(9.1% , 12.0%)

Data table for Figure 16. Youth with current asthma by grade and sex, 2010: Washington Healthy Youth Survey, 2010

Sex	6th grade	95% CI	8th grade	95% CI	10th grade	95% CI	12th grade	95% CI
Boys	7.4%	(6.7% , 8.3%)	8.8%	(7.7% , 9.9%)	7.9%	(6.6% , 9.5%)	6.1%	(4.8% , 7.8%)
Girls	6.9%	(6.1% , 7.6%)	9.2%	(8.2% , 10.5%)	11.3%	(10.0% , 12.7%)	9.6%	(8.1% , 11.2%)

Data table for Figure 17. Youth with current asthma by race and Hispanic ethnicity, 2008 and 2010: Washington Healthy Youth Survey, combined 2008 and 2010; grades 6-8-10-12 standardized

Race	Asthma	95% CI
White*	8.9%	(8.4% , 9.4%)
Black*	10.5%	(9.1% , 12.2%)
Asian*	5.6%	(4.9% , 6.5%)
Pacific Islander*	8.5%	(6.7% , 10.8%)
Native American*	10.7%	(9.1% , 12.4%)
Hispanic	7.1%	(6.3% , 7.9%)

Data table for Figure 18. Youth with current asthma by maternal educational attainment, 2008 and 2010: Washington Healthy Youth Survey, combined 2008 and 2010; grades 6-8-10-12 standardized

Education	Asthma	95% CI
Some High School	10.7%	(9.4% , 12.1%)
High School Grad/ GED	9.2%	(8.3% , 10.2%)
Some College	10.1%	(9.3% , 11.0%)
College Grad	8.3%	(7.6% , 9.2%)

Data table for Figure 19. Adults with current asthma by smoking status, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

Year	Never smoked	95% CI	Former smoker	95% CI	Current smoker	95% CI
2008	8.4%	(7.7% , 9.2%)	10.6%	(9.6% , 11.6%)	10.5%	(9.0% , 12.1%)
2009	8.4%	(7.6% , 9.2%)	9.1%	(8.2% , 10.0%)	10.0%	(8.3% , 12.0%)
2010	8.7%	(7.9% , 9.5%)	9.5%	(8.6% , 10.6%)	13.5%	(11.4% , 16.0%)

Data table for Figure 20. Current smoking among adults with or without asthma, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

Year	With current asthma	95% CI	Without current asthma		95% CI
				95% CI	
2008	17.3%	(15.0% , 19.9%)	15.1%	(14.4% , 16.0%)	
2009	16.7%	(14.0% , 19.9%)	14.5%	(13.7% , 15.4%)	
2010	21.0%	(17.8% , 24.5%)	14.2%	(13.4% , 15.1%)	

Data table for Figure 21. Youth with current asthma by smoking status and gender, 2008 and 2010: Washington Healthy Youth Survey, combined 2008-2010; grades 6-8-10-12 standardized

Sex	Current Smoker	95% CI	Non-smoker	95% CI	Total	95% CI
Boys	9.5%	(8.0% , 11.1%)	7.5%	(7.1% , 8.0%)	7.7%	(7.3% , 8.1%)
Girls	13.0%	(11.3% , 15.0%)	8.7%	(8.3% , 9.3%)	9.1%	(8.6% , 9.6%)

Data table for Figure 22. Lifetime and current asthma among adults by exposure to second hand smoke in the home, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

No SHS	Lifetime Asthma	95% CI	Current Asthma	95% CI
No SHS	14.7%	(14.0% , 15.5%)	8.9%	(8.4% , 9.5%)
SHS	18.0%	(15.1% , 21.3%)	10.8%	(8.9% , 12.9%)

Data table for Figure 23. Adults with current asthma by BMI status and gender, 2008-2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010

Gender	Obese	95% CI	Overweight	95% CI	Neither obese nor overweight	95% CI	Total	95% CI
Men	9.1%	(7.4% , 11.1%)	6.7%	(5.5% , 8.2%)	7.0%	(5.3% , 7.3%)	7.4%	(6.5% , 8.4%)
Women	18.7%	(16.4% , 21.2%)	11.5%	(10.1% , 13.1%)	8.5%	(9.1% , 9.8%)	11.9%	(11.0% , 12.9%)

Data table for Figure 24. Youth with current asthma by BMI status and gender, 2008 and 2010: Washington Healthy Youth Survey, combined 2008-2010; grades 6-8-10-12 standardized

Sex	Obese	95% CI	Overweight	95% CI	Not overweight	95% CI
Boys	10.2%	(8.5% , 12.1%)	9.1%	(7.6% , 10.8%)	6.9%	(6.3% , 8.9%)
Girls	16.3%	(13.7% , 19.3%)	11.9%	(10.0% , 14.0%)	9.6%	(7.6% , 10.4%)

Data table for Figure 25. Adults who reported their asthma had been caused by or made worse by the work environment by asthma status, 2008-2010: Washington Behavioral Risk Factor Surveillance System, Adult Asthma Callback Surveys, 2008-2010

	Current asthma	95% CI
CURRENT job caused asthma	9.4%	(6.8% , 12.9%)
CURRENT job worsened asthma	24.7%	(20.6% , 29.3%)
PREVIOUS job caused asthma	18.8%	(15.6% , 22.6%)
PREVIOUS job worsened asthma	34.0%	(30.2% , 38.0%)
Any history of work related asthma	40.7%	(36.9% , 44.6%)

Data table for Figure 26. Self-management and education among adults with current asthma, 2008-2010: Washington Behavioral Risk Factor Surveillance System, Adult Asthma Callback Surveys, 2008-2010

	Received information	95% CI
Received explanation on how to recognize early signs of asthma episode	61.4%	(57.4% , 65.3%)
Received information on what to do during an attack	74.9%	(71.2% , 78.3%)
Taught how to use peak flow meter	43.1%	(39.0% , 47.3%)
Given a written asthma action plan	26.1%	(22.5% , 30.1%)
Advised to change environment to improve asthma	39.7%	(35.8% , 43.7%)
Taken an asthma management class	8.6%	(6.2% , 11.9%)

Data table for Figure 27. Use of complementary medication among adults with current asthma, 2008-2010: Washington Behavioral Risk Factor Surveillance System, Adult Asthma Callback Surveys, 2008-2010

	Received information	95% CI
Homeopathy	1.9%	(1.3% , 2.8%)
Yoga	3.1%	(2.1% , 4.4%)
Aromatherapy	3.6%	(2.1% , 5.9%)
Vitamins	5.7%	(4.4% , 7.4%)
Herbs	5.2%	(3.9% , 6.9%)
Breathing techniques	29.1%	(25.6% , 32.8%)

Data table for Figure 28. Washington youth with asthma who have a written asthma plan, 2008 and 2010: Washington Healthy Youth Survey, combined 2008-2010; grades 6-8-10-12 standardized

	Asthma	95% CI
No written asthma plan	44.8%	(40.8% , 48.8%)
Have written asthma plan	32.7%	(28.8% , 36.8%)
Don't know	22.5%	(19.8% , 25.6%)

Data table for Figure 29. Frequency rescue inhaler use in past month among youth with asthma, 2010: Washington Healthy Youth Survey, 2010; grades 8-10-12 combined

	Asthma	95% CI
Never	52.0%	(47.7% , 56.3%)
1-2 days per week	30.0%	(26.4% , 34.0%)
3-6 days per week	7.8%	(6.0% , 10.1%)
Every day	10.1%	(7.9% , 12.9%)

Data table for Figure 30. Access to health care among adults with or without asthma, 2010: Washington Behavioral Risk Factor Surveillance System, 2010

	No personal doctor	95% CI	Unmet need due to cost	95% CI	Lack of checkup in past year	95% CI
Adults without current asthma	22.3%	(21.2% , 23.5%)	12.1%	(11.3% , 12.9%)	39.0%	(37.8% , 40.2%)
Adults with current asthma	14.6%	(11.9% , 17.8%)	19.9%	(16.8% , 23.5%)	34.6%	(31.2% , 38.1%)

Data table for Figure 31. Vaccinations among adults with or without asthma, 2010: Washington Behavioral Risk Factor Surveillance System, 2010

	Seasonal flu vaccination	95% CI	Pneumococcal vaccination	95% CI
Adults without asthma	41.1%	(40.0% , 42.2%)	28.9%	(27.8% , 30.0%)
Adults with asthma	49.6%	(46.0% , 53.2%)	44.8%	(41.1% , 48.5%)

Data table for Figure 32. Asthma health care utilization among youth with current asthma, 2008 and 2010: Washington Healthy Youth Survey, 2008 and 2010; grades 8-10-12 combined

	Youth with Asthma	95% CI	Youth w/o Asthma	95% CI
Lack of routine health visit in past year	27.6%	(25.1% , 30.3%)	32.4%	(31.3% , 33.6%)
One or more ER visit in past year	25.1%	(30.3% , 0.0%)	N/A	(0.0% , 0.0%)

Data table for Figure 33. Perceived poor health and activity limitations among adults with or without asthma, 2010: Washington Behavioral Risk Factor Surveillance System, 2010

	Fair/poor physical health	95% CI	Poor mental health	95% CI	Activity limitations	95% CI
Adults without current asthma	11.6%	(11.0% , 12.3%)	43.0%	(41.3% , 44.7%)	34.5%	(33.3% , 35.7%)
Adults with current asthma	27.8%	(24.9% , 31.0%)	55.7%	(51.3% , 60.0%)	49.0%	(45.3% , 52.6%)

Data table for Figure 34. Adults with current asthma who missed one or more days of work or other activities because of asthma in the past 12 months, by household income, 2008-2010: Washington Behavioral Risk Factor Surveillance System, Asthma Callback Surveys, 2008-2010

	< \$35K	95% CI	\$35K - \$50K	95% CI	> \$50K	95% CI	All adults	95% CI
Adults with asthma who miss one or more days	26.3%	(21.1% , 32.2%)	32.6%	(23.9% , 42.6%)	19.8%	(15.7% , 24.7%)	23.2%	(20.2% , 26.4%)

Data table for Figure 35. Sleep disturbances due to asthma in the past 30 days among adults with asthma, 2008-2010: Washington Behavioral Risk Factor Surveillance System, Asthma Callback Surveys, 2008-2010

	None	95% CI	1 - 9 days	95% CI	10 - 29 days	95% CI	Everyday	95% CI
Number of days with sleep disturbances due to asthma	70.9%	(66.8% , 74.7%)	15.6%	(12.9% , 18.8%)	9.2%	(6.7% , 12.5%)	4.3%	(2.7% , 6.7%)

Data table for Figure 36. Frequency of asthma symptoms in the past 30 days among adults with asthma, 2008-2010: Washington Behavioral Risk Factor Surveillance System, Asthma Callback Surveys, 2008-2010

	None	95% CI	1 - 9 days	95% CI	10 - 29 days	95% CI	Everyday	95% CI
Number of days with asthma symptoms	23.7% (20.1% , 27.7%)		30.8% (27.0% , 34.9%)		22.0% (18.7% , 25.7%)		23.5% (20.0% , 27.4%)	

Data table for Figure 37. Frequency of asthma episodes or attacks in the past 3 months among adults with asthma, 2008-2010: Washington Behavioral Risk Factor Surveillance System, Asthma Callback Surveys, 2008-2010

	None	95% CI	1 - 9 episodes/attacks	95% CI	10 or more episodes/attacks	95% CI
Number of asthma attacks or episodes	63.8% (59.8% , 67.7%)		28.5% (25.1% , 32.2%)		7.6% (5.5% , 10.5%)	

Data table for Figure 38. Prevalence of depression and suicidal thoughts among youth with or without asthma, 2008 and 2010: Washington Healthy Youth Survey, combined 2008 and 2010; grades 8-10-12 standardized

	Depression	95% CI	Suicidal thoughts	95% CI
Youth without current asthma	25.8% (25.0% , 26.6%)		13.4% (12.9% , 14.0%)	
Youth with current asthma	35.0% (32.9% , 37.2%)		19.4% (17.4% , 21.5%)	

Data table for Figure 39. Prevalence of disability and limited activities among youth with or without asthma, 2008 and 2010: Washington Healthy Youth Survey, combined 2008 and 2010; grades 8-10-12 standardized

	Have disability or long-term health problems	95% CI	Others think you have a disability	95% CI	Limited activities because of disability or long-term health problems	95% CI
Youth without current asthma	10.5% (9.8% , 11.2%)		9.4% (8.7% , 10.2%)		6.1% (5.6% , 6.6%)	
Youth with current asthma	47.3% (44.2% , 50.5%)		23.6% (20.7% , 26.7%)		29.7% (26.8% , 32.8%)	

Data table for Figure 40. Frequency of asthma symptoms in the past month among youth with asthma, 2010: Washington Healthy Youth Survey, 2010; grades 8-10-12 standardized

	Youth with asthma	95% CI
None	26.4%	(23.2% , 29.9%)
1-2 days per week	39.5%	(35.7% , 43.3%)
3-6 days per week	16.9%	(14.4% , 19.7%)
Every day	12.3%	(9.8% , 15.3%)
Not sure	5.0%	(3.5% , 6.9%)

Data table for Figure 41. Percent of youth who missed school because of asthma during the past year, 2008 and 2010: Washington Healthy Youth Survey, combined 2008 and 2010

	Youth with asthma	95% CI
8th grade	25.1%	(21.4% , 29.3%)
10th grade	25.7%	(21.1% , 30.8%)
12th grade	22.8%	(19.0% , 27.1%)

Data table for Figure 42. Distribution of days missed school days during the past year among youth with asthma who missed school, 2008 and 2010: Washington Healthy Youth Survey, combined 2008 and 2010; grades 8-10-12 standardized

	Distribution of days missed	95% CI
1-2 days	57.6%	(52.3% , 62.8%)
3-4 days	20.2%	(15.6% , 25.7%)
5-10 days	10.2%	(7.3% , 13.9%)
More than 10 days	12.1%	(8.8% , 16.4%)

Data table for Figure 43. Asthma hospital discharge rates: Washington and U.S., 2000-2010: Washington Comprehensive Hospital Abstract Reporting System, age standardized to year 2000 population, 2000-2010

Asthma Hospitalization Rates rate per 100,000				
Year	US	WA	95% CI	WA-Count
2000	174.0	93.0	(90.6 , 95.6)	5398
2001	167.0	90.0	(87.6 , 92.4)	5274
2002	160.0	94.4	(91.9 , 96.9)	5610
2003	168.0	82.3	(80.0 , 84.6)	4951
2004	198.0	76.3	(74.1 , 78.6)	4650
2005	170.0	85.4	(83.1 , 87.7)	5274
2006	166.0	72.6	(70.5 , 74.8)	4579
2007	149.0	73.3	(71.2 , 75.5)	4706
2008	152.0	72.7	(70.6 , 74.8)	4746
2009	149.0	77.7	(75.6 , 79.9)	5134
2010	157.0	73.2	(71.1 , 75.3)	4875

Data table for Figure 44. Asthma hospital discharge rates by age groups, 2000-2010: Washington Comprehensive Hospital Abstract Reporting System, 2000-2010

Asthma Hospitalization Rates rate per 100,000			
Year	0-4	5-64	65+
2000	369.3	64.7	111.8
2001	325.1	62.1	130.2
2002	336.0	65.8	138.2
2003	257.8	58.5	134.9
2004	277.4	53.1	113.8
2005	292.1	60.4	124.1
2006	252.6	51.5	107.8
2007	214.9	54.4	113.0
2008	222.0	52.3	117.0
2009	211.3	60.3	107.4
2010	216.3	55.7	99.7

Data table for Figure 45. Asthma hospital discharge rates by gender, 2000-2010: Washington Comprehensive Hospital Abstract Reporting System, age standardized to year 2000 population, 2000-2010

Washington State Asthma Hospitalizations				
Year	Males	95% CI	Females	95% CI
2000	93.0	(90.6 , 95.6)	104.3	(100.6 , 108.0)
2001	90.0	(87.6 , 92.4)	105.2	(101.5 , 108.9)
2002	94.4	(91.9 , 96.9)	107.5	(103.8 , 111.3)
2003	82.3	(80.0 , 84.6)	97.6	(94.2 , 101.2)
2004	76.3	(74.1 , 78.6)	88.4	(85.1 , 91.8)
2005	85.4	(83.1 , 87.7)	100.2	(96.7 , 103.8)
2006	72.6	(70.5 , 74.8)	82.8	(79.7 , 86.0)
2007	73.3	(71.2 , 75.5)	84.5	(81.3 , 87.7)
2008	72.7	(70.6 , 74.8)	84.4	(81.3 , 87.6)
2009	77.7	(75.6 , 79.9)	89.7	(86.5 , 93.0)
2010	73.2	(71.1 , 75.3)	83.8	(80.7 , 87.0)

Data table for Figure 46. Asthma hospital discharge rates by age groups and gender, 2008-2010: Washington Hospital Discharge Data, Comprehensive Hospitalization Abstract Reporting System 2008-2010.

Washington State Asthma Hospitalizations				
Age	Male	95% CI	Female	95% CI
< 1 yr	164.15	(143.3 , 187.2)	81.0	(66.2 , 98.0)
1 - 4 yrs	306.41	(291.7 , 321.6)	172.6	(161.4 , 184.4)
5 - 14 yrs	92.65	(87.6 , 98.0)	56.4	(52.3 , 60.7)
15 - 24 yrs	19.85	(17.6 , 22.3)	33.0	(30.0 , 36.2)
25 - 34 yrs	19.89	(17.6 , 22.4)	55.1	(51.2 , 59.2)
35 - 44 yrs	30.83	(28.0 , 33.9)	87.5	(82.6 , 92.6)
45 - 54 yrs	36.72	(33.7 , 39.9)	103.1	(98.0 , 108.4)
55 - 64 yrs	37.7	(34.3 , 41.4)	104.4	(98.8 , 110.3)
65 - 74 yrs	45.44	(40.3 , 51.0)	125.4	(117.1 , 134.1)
75 - 84 yrs	82.73	(73.2 , 93.2)	153.1	(141.6 , 165.3)
75 + yrs	99.49	(82.2 , 119.3)	170.4	(153.9 , 188.3)

Data table for Figure 47. Asthma hospital discharge rates by month, 2010: Washington Comprehensive Hospital Abstract Reporting System, 2010

Hospital Discharges by Month	
Month	Discharges
January	476
February	518
March	530
April	402
May	321
June	317
July	297
August	268
September	458
October	444
November	409
December	368

Data table for Figure 48. Asthma death rates: Washington and U.S., 2000-2010: Washington State Death Certificate Data; asthma as primary cause of death, 2000-2010

Asthma Death Rates				
rate per million				
Year	US	WA	95% CI	WA-Count
1999	15.0	16.2	(13.0 , 20.0)	88
2000	15.0	15.2	(12.1 , 18.8)	84
2001	14.0	15.0	(12.0 , 18.6)	85
2002	14.0	16.0	(12.9 , 19.7)	93
2003	13.0	14.1	(11.2 , 17.5)	84
2004	12.0	13.4	(10.7 , 16.7)	81
2005	12.0	13.1	(10.4 , 16.3)	83
2006	11.0	11.9	(9.4 , 15.0)	76
2007	10.0	10.0	(7.7 , 12.8)	66
2008	10.0	10.6	(8.3 , 13.4)	72
2009	0.0	10.6	(8.3 , 13.3)	76
2010	0.0	10.5	(8.2 , 13.3)	74

Data table for Figure 49. Asthma death rates by gender, 2000-2010: Washington State Death Certificate Data; asthma as primary cause of death, age-standardized 2000-2010

Asthma Death Rates by Gender				
rate per million				
Year	Males	95% CI	Females	95% CI
2000	11.4	(7.4 , 17.0)	18.4	(13.9 , 23.9)
2001	12.0	(8.0 , 17.4)	17.4	(13.0 , 22.7)
2002	9.8	(6.3 , 14.7)	20.9	(16.2 , 26.6)
2003	12.3	(8.2 , 17.8)	15.6	(11.7 , 20.5)
2004	8.6	(5.5 , 13.1)	16.8	(12.6 , 21.8)
2005	12.4	(8.5 , 17.6)	13.9	(10.2 , 18.5)
2006	9.4	(6.0 , 14.1)	14.2	(10.5 , 18.8)
2007	5.9	(3.4 , 9.7)	13	(9.6 , 17.4)
2008	7.9	(5.0 , 12.0)	13	(9.5 , 17.5)
2009	7.4	(4.6 , 11.4)	13.4	(10.0 , 17.7)
2010	8.5	(5.5 , 12.5)	11.7	(8.5 , 15.7)

Data table for Figure 50. Asthma death rates by age groups, 2010: Washington State Death Certificate Data; asthma as primary cause of death, 2010

Asthma Death Rates by Age Groups		
rate per million		
Age	2010	95% CI
18-64	7.0	(4.7 , 9.9)
65+	50.7	(36.6 , 68.6)

Data table for Figure 51. Asthma death rates by race, 1999-2009: Washington State Death Certificate Data; asthma as primary cause of death, age-standardized by year 2000, 1999-2009

Asthma Death Rates by Race/Ethnicity		
rate per million		
Race/Ethnicity	1999-2009	95% CI
American Indian/Alaskan Native-NH	30.2	(17.3 , 51.4)
Asian/Pacific Islander-NH	19.6	(14.3 , 26.3)
Black-NH	24.3	(17.5 , 33.7)
Hispanic as Race	18.8	(11.1 , 30.2)
White-NH	12.3	(11.4 , 13.2)

Data table for Map 1. Adults with current asthma by county, 2008-2010 & **Map 2.** Youth with current asthma by county, 2008 and 2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010 and Washington Healthy Youth Survey, grades 6-8-10-12, 2008-2010

County	Adults with Asthma		Youth with Asthma	
	Percent	95% CI	Percent	95% CI
Adams	7.0	(4.8 , 10.0)	8.0	(6.5 , 9.7)
Asotin	11.8	(8.9 , 15.5)	8.4	(6.7 , 10.5)
Benton	7.3	(5.8 , 9.3)	8.8	(8.2 , 9.5)
Chelan	8.2	(6.3 , 10.7)	8.4	(7.4 , 9.4)
Clallam	9.5	(7.4 , 12.2)	8.4	(7.0 , 10.2)
Clark	9.0	(7.9 , 10.2)	8.6	(8.2 , 9.1)
Columbia	9.4	(6.4 , 13.6)	11.2	(7.0 , 17.3)
Cowlitz	12.7	(9.9 , 16.1)	10.3	(9.4 , 11.2)
Douglas	10.1	(7.7 , 13.1)	8.4	(7.2 , 9.8)
Ferry	10.7	(7.9 , 14.4)	7.6	(4.8 , 12.0)
Franklin	9.5	(6.7 , 13.2)	5.6	(4.9 , 6.5)
Garfield	9.7	(7.1 , 13.2)	12.1	(7.0 , 20.2)
Grant	8.6	(6.5 , 11.3)	7.7	(6.9 , 8.6)
Grays Harbor	9.3	(7.2 , 11.8)	9.6	(8.5 , 10.8)
Island	8.1	(6.3 , 10.3)	8.9	(7.8 , 10.2)
Jefferson	9.8	(7.2 , 13.2)	7.2	(5.4 , 9.5)
King	8.4	(7.7 , 9.2)	7.7	(7.2 , 8.2)
Kitsap	11.5	(9.9 , 13.3)	8.6	(8.0 , 9.2)
Kittitas	7.2	(5.2 , 9.8)	6.5	(5.3 , 8.0)
Klickitat	8.1	(5.7 , 11.4)	8.6	(6.9 , 10.7)
Lewis	9.0	(6.8 , 11.9)	9.7	(8.6 , 10.8)
Lincoln	10.5	(7.8 , 13.9)	7.6	(5.6 , 10.3)
Mason	9.1	(6.6 , 12.4)	9.7	(8.5 , 11.2)
Okanogan	10.2	(7.9 , 13.0)	9.5	(8.2 , 11.1)
Pacific	11.7	(8.9 , 15.3)	7.5	(5.8 , 9.7)
Pend Oreille	5.9	(4.2 , 8.2)	7.3	(5.3 , 10.0)
Pierce	10.2	(9.2 , 11.4)	9.6	(9.1 , 10.1)
San Juan	9.9	(6.9 , 14.0)	8.2	(6.0 , 11.2)
Skagit	7.8	(6.1 , 10.0)	7.6	(6.9 , 8.4)
Skamania	8.2	(5.9 , 11.3)	7.2	(4.8 , 10.9)
Snohomish	9.5	(8.4 , 10.8)	8.0	(7.6 , 8.5)
Spokane	10.0	(8.7 , 11.5)	10.1	(9.5 , 10.7)
Stevens	8.1	(6.1 , 10.6)	8.5	(6.9 , 10.4)
Thurston	11.1	(9.6 , 12.9)	8.7	(8.2 , 9.3)
Wahkiakum	12.7	(7.7 , 20.3)	12.0	(7.7 , 18.1)
Walla Walla	9.3	(7.1 , 12.0)	8.9	(7.8 , 10.2)
Whatcom	7.8	(6.1 , 9.9)	9.2	(8.5 , 9.9)
Whitman	10.6	(8.1 , 13.9)	9.7	(8.1 , 11.5)
Yakima	8.2	(6.8 , 9.9)	8.0	(7.5 , 8.5)

Data table for Map 3. Adult cigarette use by county, 2008-2010 & Map 4. Youth cigarette use by county, 2008 and 2010: Washington Behavioral Risk Factor Surveillance System, 2008-2010 and Washington Healthy Youth Survey, grades 6-8-10-12, 2008-2010

County	Adult Smoking		Youth Smoking	
	Percent	95% CI	Percent	95% CI
Adams	9.7	(7.0 , 13.4)	7.5	(6.3 , 8.9)
Asotin	22.1	(18.1 , 26.8)	16.0	(14.1 , 18.1)
Benton	14.1	(11.4 , 17.4)	12.3	(11.7 , 12.9)
Chelan	12.9	(10.3 , 16.1)	10.0	(9.2 , 11.0)
Clallam	17.1	(13.8 , 21.1)	5.9	(4.7 , 7.4)
Clark	16.1	(14.4 , 17.9)	13.4	(13.0 , 13.9)
Columbia	17.2	(11.7 , 24.6)	16.1	(11.8 , 21.5)
Cowlitz	23.6	(19.7 , 27.8)	12.7	(11.9 , 13.5)
Douglas	16.1	(12.9 , 19.8)	12.2	(11.0 , 13.6)
Ferry	26.6	(20.8 , 33.5)	11.2	(7.9 , 15.8)
Franklin	8.3	(5.7 , 12.0)	8.7	(7.9 , 9.5)
Garfield	20.3	(13.2 , 29.9)	12.7	(8.2 , 19.1)
Grant	15.9	(12.6 , 19.8)	10.3	(9.6 , 11.2)
Grays Harbor	23.6	(20.0 , 27.6)	14.9	(13.8 , 16.1)
Island	15.8	(12.6 , 19.5)	12.2	(11.1 , 13.4)
Jefferson	17.4	(13.4 , 22.2)	12.3	(10.4 , 14.5)
King	11.5	(10.5 , 12.5)	9.3	(8.9 , 9.7)
Kitsap	16.5	(14.6 , 18.6)	13.5	(12.9 , 14.1)
Kittitas	14.5	(11.1 , 18.6)	11.9	(10.5 , 13.5)
Klickitat	15.9	(12.6 , 19.9)	12.9	(11.1 , 14.9)
Lewis	19.5	(15.9 , 23.6)	11.9	(10.9 , 12.9)
Lincoln	14.6	(11.4 , 18.5)	14.3	(11.9 , 17.0)
Mason	25.9	(21.6 , 30.7)	17.3	(16.0 , 18.7)
Okanogan	22.6	(18.8 , 26.9)	11.1	(9.9 , 12.4)
Pacific	21.0	(16.2 , 26.7)	12.9	(11.0 , 15.0)
Pend Oreille	19.2	(14.5 , 24.9)	10.9	(8.8 , 13.4)
Pierce	17.1	(15.7 , 18.6)	14.3	(13.8 , 14.8)
San Juan	11.0	(8.0 , 14.9)	11.1	(9.0 , 13.8)
Skagit	14.6	(11.7 , 18.1)	10.7	(10.0 , 11.4)
Skamania	21.5	(15.5 , 29.0)	25.7	(20.6 , 31.6)
Snohomish	14.8	(13.4 , 16.5)	12.8	(12.4 , 13.3)
Spokane	17.7	(15.9 , 19.6)	15.9	(15.4 , 16.4)
Stevens	21.4	(16.9 , 26.6)	13.0	(11.2 , 14.9)
Thurston	18.7	(16.6 , 21.0)	13.1	(12.6 , 13.7)
Wahkiakum	12.3	(8.4 , 17.8)	10.0	(6.7 , 14.8)
Walla Walla	14.0	(10.6 , 18.2)	12.3	(11.2 , 13.5)
Whatcom	13.2	(10.7 , 16.1)	11.1	(10.5 , 11.8)
Whitman	11.5	(8.8 , 15.0)	7.9	(6.7 , 9.3)
Yakima	15.3	(13.3 , 17.6)	8.6	(8.2 , 9.0)

Data table for Map 5. Adult obesity by county, 2008-2010 & **Map 6.** Youth obesity by county, 2008 and 2010:
 Washington Behavioral Risk Factor Surveillance System, 2008-2010 and Washington Healthy Youth Survey, grades 6-8-10-12, 2008-2010

County	Adult Obesity		Youth Obesity	
	Percent	95% CI	Percent	95% CI
Adams	35.0	(29.8 , 40.6)	16.9	(14.0 , 20.3)
Asotin	28.9	(24.7 , 33.4)	14.0	(11.1 , 17.5)
Benton	28.7	(25.4 , 32.3)	11.5	(10.6 , 12.5)
Chelan	25.1	(21.6 , 28.9)	12.4	(10.9 , 14.1)
Clallam	28.3	(24.4 , 32.5)	11.3	(9.1 , 14.1)
Clark	28.5	(26.4 , 30.6)	10.5	(9.9 , 11.2)
Columbia	30.0	(18.5 , 44.8)	13.4	(7.6 , 22.4)
Cowlitz	36.1	(31.9 , 40.6)	13.0	(11.8 , 14.4)
Douglas	26.0	(22.0 , 30.5)	12.9	(11.0 , 15.2)
Ferry	22.1	(18.1 , 26.6)	10.7	(5.8 , 19.0)
Franklin	30.5	(25.5 , 36.1)	14.4	(12.8 , 16.1)
Garfield	38.1	(30.6 , 46.2)	19.4	(11.2 , 31.5)
Grant	31.0	(26.6 , 35.8)	14.4	(12.9 , 16.1)
Grays Harbor	30.8	(27.0 , 34.9)	14.9	(13.2 , 16.8)
Island	25.4	(21.8 , 29.4)	9.3	(7.8 , 11.1)
Jefferson	24.9	(20.8 , 29.4)	8.4	(5.9 , 11.7)
King	21.3	(20.2 , 22.5)	8.6	(8.0 , 9.2)
Kitsap	27.0	(24.9 , 29.3)	10.4	(9.6 , 11.2)
Kittitas	21.5	(18.0 , 25.5)	10.2	(8.1 , 12.6)
Klickitat	28.0	(23.4 , 33.2)	10.6	(8.1 , 13.8)
Lewis	35.8	(31.3 , 40.5)	13.8	(12.1 , 15.6)
Lincoln	32.1	(26.8 , 37.8)	9.0	(6.3 , 12.8)
Mason	33.0	(28.2 , 38.1)	14.8	(12.8 , 17.0)
Okanogan	27.7	(23.4 , 32.5)	12.5	(10.4 , 14.9)
Pacific	32.6	(27.8 , 37.9)	13.7	(10.7 , 17.3)
Pend Oreille	30.6	(22.2 , 40.5)	11.0	(7.8 , 15.4)
Pierce	29.2	(27.6 , 31.0)	11.2	(10.6 , 11.8)
San Juan	16.5	(13.1 , 20.7)	8.5	(5.8 , 12.3)
Skagit	26.6	(23.0 , 30.5)	11.0	(9.9 , 12.3)
Skamania	31.5	(26.5 , 36.9)	14.9	(10.3 , 21.2)
Snohomish	27.1	(25.4 , 28.9)	10.4	(9.8 , 11.1)
Spokane	26.8	(24.9 , 28.9)	9.6	(8.9 , 10.3)
Stevens	26.9	(22.4 , 32.0)	10.8	(8.6 , 13.4)
Thurston	26.5	(24.3 , 28.8)	10.5	(9.7 , 11.3)
Wahkiakum	27.8	(19.0 , 38.6)	9.5	(4.7 , 18.3)
Walla Walla	27.5	(23.5 , 31.9)	12.8	(11.0 , 14.8)
Whatcom	22.3	(19.4 , 25.6)	10.0	(9.0 , 11.0)
Whitman	25.3	(21.6 , 29.3)	10.0	(7.9 , 12.5)
Yakima	31.4	(28.7 , 34.2)	14.4	(13.6 , 15.3)

Data table for Map 7. Washington State number of days PM_{2.5} levels were higher than Washington Air Quality Advisory standard by county, 2010: Washington Tracking Network

County	PM 2.5 - Days per Year Above Standard, 2010
Adams	11
Asotin	33
Benton	19
Chelan	66
Clallam	7
Clark	29
Columbia	7
Cowlitz	4
Douglas	No Monitor
Ferry	No Monitor
Franklin	15
Garfield	No Monitor
Grant	15
Grays Harbor	4
Island	No Monitor
Jefferson	7
King	29
Kitsap	37
Kittitas	51
Klickitat	No Monitor
Lewis	4
Lincoln	No Monitor
Mason	11
Okanogan	80
Pacific	No Monitor
Pend Oreille	4
Pierce	37
San Juan	No Monitor
Skagit	0
Skamania	No Monitor
Snohomish	44
Spokane	40
Stevens	88
Thurston	15
Wahkiakum	No Monitor
Walla Walla	29
Whatcom	7
Whitman	7
Yakima	66

Data table for Map 8. Asthma hospital discharge rates by county, 2008-2010: Washington Comprehensive Hospitalization Abstract Reporting System, 2008-2010

County	Asthma Hospitalizations	
	Rate per 100,000	95% CI
Adams	16.9	(14.0 , 20.3)
Asotin	14.0	(11.1 , 17.5)
Benton	11.5	(10.6 , 12.5)
Chelan	12.4	(10.9 , 14.1)
Clallam	11.3	(9.1 , 14.1)
Clark	10.5	(9.9 , 11.2)
Columbia	13.4	(7.6 , 22.4)
Cowlitz	13.0	(11.8 , 14.4)
Douglas	12.9	(11.0 , 15.2)
Ferry	10.7	(5.8 , 19.0)
Franklin	14.4	(12.8 , 16.1)
Garfield	19.4	(11.2 , 31.5)
Grant	14.4	(12.9 , 16.1)
Grays Harbor	14.9	(13.2 , 16.8)
Island	9.3	(7.8 , 11.1)
Jefferson	8.4	(5.9 , 11.7)
King	8.6	(8.0 , 9.2)
Kitsap	10.4	(9.6 , 11.2)
Kittitas	10.2	(8.1 , 12.6)
Klickitat	10.6	(8.1 , 13.8)
Lewis	13.8	(12.1 , 15.6)
Lincoln	9.0	(6.3 , 12.8)
Mason	14.8	(12.8 , 17.0)
Okanogan	12.5	(10.4 , 14.9)
Pacific	13.7	(10.7 , 17.3)
Pend Oreille	11.0	(7.8 , 15.4)
Pierce	11.2	(10.6 , 11.8)
San Juan	8.5	(5.8 , 12.3)
Skagit	11.0	(9.9 , 12.3)
Skamania	14.9	(10.3 , 21.2)
Snohomish	10.4	(9.8 , 11.1)
Spokane	9.6	(8.9 , 10.3)
Stevens	10.8	(8.6 , 13.4)
Thurston	10.5	(9.7 , 11.3)
Wahkiakum	9.5	(4.7 , 18.3)
Walla Walla	12.8	(11.0 , 14.8)
Whatcom	10.0	(9.0 , 11.0)
Whitman	10.0	(7.9 , 12.5)
Yakima	14.4	(13.6 , 15.3)

Behavioral Risk Factor Surveillance System (BRFSS)

The Behavioral Risk Factor Surveillance System (BRFSS) is a statewide random-digit-dialing telephone survey coordinated by the Centers for Disease Control & Prevention (CDC) and conducted in all 50 states. Interviews are conducted on a monthly basis and combined by calendar year, and weighted to be representative of the adult population of Washington. Adult asthma prevalence is based on whether a respondent reported current asthma.

In 2008-2010, more than 62,000 Washington respondents were asked about asthma.

Caveats

- The response rate for the BRFSS changed from 61 percent in 1995 to about 40 percent in 2010. Similar changes have been seen in all other states and in other telephone surveys. The drop is due to a combination of people being less willing to cooperate and new technology allowing people to screen phone calls. CDC has assessed the impact of low response rates and has concluded that as long as the response rate is between 30 percent and 80 percent, the results are not biased due to response rate.
- BRFSS might under-represent poorer, more mobile, and non-white populations because they are less likely to live in homes with telephones.
- BRFSS does not represent people who live in institutions.
- Characteristics of people who refuse to participate are unknown.
- Health risk behavior might be underestimated because people might be reluctant to report behaviors that others might not find acceptable.
- Use of preventive services might be underestimated because of recall error.

For Further Information

- Washington State BRFSS web site:
<http://www.doh.wa.gov/DataandStatisticalReports/HealthBehaviors/BehavioralRiskFactorSurveillanceSystemBRFSS.aspx> For more information on national BRFSS, go to: <http://www.cdc.gov/brfss>

Washington State Department of Health, Center for Health Statistics, Behavioral Risk Factor Surveillance System, supported in part by Centers for Disease Control and Prevention, Cooperative Agreement U58/CCU002118- 1 through 17 (1987-2003), U58/CCU022819-1 through 5 (2004-2008), U58 DP001996-1 through 2 (2009-2010), or U58/SO000047-1 through 3 (2011-2013).

BRFSS, Asthma Callback Surveys (ACBS)

The ACBS is an in-depth asthma survey conducted approximately two weeks after the Behavioral Risk Factor Surveillance Survey (BRFSS). BRFSS respondents who report ever being diagnosed with asthma are eligible for the asthma call-back. The ACBS addresses critical questions surrounding the health and experiences of persons with asthma. Through the callback, the Washington Asthma Program collects detailed information on topics such as health care utilization, knowledge of asthma, asthma management, asthma medications, environmental factors, costs, co-morbid conditions, work related asthma, and complementary and alternative medicines.

Caveats

- The ACBS has many of the same limitations described for the BRFSS.
- Not all people from the standard BRFSS are reached. This may lead to differences between the original respondents and those respondents who also complete the callback survey.

For Further Information

- For more information on national ACBS, go to: <http://www.cdc.gov/asthma/ACBS.htm>

Washington State Healthy Youth Survey (HYS)

The HYS is a “pencil-and-paper” school based survey of adolescents in grades 6,8,10 and 12 administered in the classroom. It is intended to monitor health-risk behaviors that contribute to morbidity, mortality, and social problems among youth in Washington. The survey is administered in the fall of even years and contains questions about behaviors that result in unintentional and intentional injury (e.g., seat belt use, fighting, and weapon carrying); physical activity and dietary behaviors (e.g., fruit and vegetable consumption); alcohol, tobacco, and other drug use; and related risk and protective factors. It includes items from the CDC-sponsored Youth Risk Behavior Survey (YRBS) and Youth Tobacco Survey, the National Institute on Drug Abuse, Monitoring the Future survey, and the Social Development Research Group’s Risk and Protective Factor Assessment instrument.

Valid state sample surveys in 2008 and 2010 are as follows:

Grade	2008	2010	Total
Grade 6	9,068	11,549	20,617
Grade 8	8,730	9,723	18,453
Grade 10	6,907	6,889	13,796
Grade 12	5,601	5,908	11,509
Total	30,346	34,069	64,415

The HYS is used to produce youth health statistics for counties, educational service districts, school districts and school buildings. Local communities are offered the opportunity to participate in the survey in order to collect data for program planning and evaluation. In 2008 and 2010, an additional 358,000 students contributed to local level results. Only schools selected as part of a random state-level sample are included in this report.

Caveats

- Youth who do not attend public schools (those attending private school, tribal school, early completion of school or dropping out of school, youth in juvenile detention facilities) are not represented in the findings.
- Youth may not accurately report medical information, including frequency of medical visits or treatment for asthma.

For Further Information

- Washington State Department of Health, Healthy Youth Survey website:
<http://www.doh.wa.gov/DataandStatisticalReports/HealthBehaviors/HealthyYouthSurvey.aspx>

Asthma Mortality

Asthma mortality data were obtained through the Washington State Death Certificate System. This system collects data on all deaths in Washington, and those of Washington residents who die in other states. Data collected for each death include: age, gender, race/ethnicity, date of death, underlying and contributing cause of death, place of residence, place of occurrence, and zip code of residence. The data are estimated to be 99 percent complete.

Issues related to reported race/ethnicity

Death certificates use open-ended reporting of race, allowing for multiple racial entries. However, the multiple race data have not been used in this report because they are of uncertain quality and completeness. The determination of race when more than one race is reported follows decision rules established by the National Center for Health Statistics (NCHS). In most cases, the first race given is assigned as the person's race.

Reporting of race/Hispanic origin on death certificates is sometimes based on observing the decedent rather than questioning the next of kin. This procedure causes an underestimate of deaths for certain groups, particularly Native Americans, some of the Asian subgroups, and Hispanics. Thus, death rates based on death certificate data are lower than true death rates for these groups.

Caveats

- Unless otherwise noted, the asthma mortality rates in this report use the underlying (principal) cause of death.
- *For Further Information*

Washington State Department of Health, Center for Health Statistics:

<http://www.doh.wa.gov/DataandStatisticalReports/VitalStatisticsData/DeathData.aspx>

Asthma Hospitalization

Asthma hospitalization data were obtained through the DOH Comprehensive Hospital Abstract Reporting System (CHARS).

It should be noted that these figures represent hospitalizations, not individuals. As patients with asthma may be hospitalized multiple times per year, these rates likely over-estimate the number of patients per year hospitalized for asthma. Data on race or ethnicity are not available for hospitalization on either the state or national level.

CHARS includes data from all inpatient stays for all patients treated in state-licensed acute care hospitals in Washington. CHARS does not include hospitalizations in U.S. military hospitals, U.S. veterans' administration hospitals, or Washington State psychiatric hospitals. For each hospitalization CHARS data includes: hospital, zip code of residence, date of birth, age, gender, discharge status, and primary and secondary diagnoses.

Cases where the primary diagnosis listed was asthma (ICD-9: 493), and age-adjusted rates to the US age distribution for the year 2000 (US Census Bureau) were used. Reasons for hospitalization are coded according to the International Classification of Disease, Clinical Modification of the Ninth Revision (ICD-9-CM). The first diagnosis field is considered to be the principal reason the patient was admitted to the hospital.

Caveats

- Unless otherwise noted, the unit of observation is the hospitalization episode not the individual. Thus, one person hospitalized several times will be counted several times. The number of hospitalizations gives us a better picture of the public health impact of a condition. Each hospitalization for an illness or injury is an adverse event for the person who experiences it. Many hospitalizations are potentially avoidable through

reductions in the factors that cause or complicate diseases and injuries or through early detection and rapid treatment.

- Hospitalization excludes emergency room visits, outpatient surgery, outpatient clinics, military and VA hospitals (greatest impact on Island county because of the large proportion of residents connected with the military), free-standing surgeries, free standing mental health, substance abuse, rehabilitation centers, and birthing centers.
- CHARS does not contain data on Washington residents hospitalized outside of Washington. This situation affects border counties, especially those adjacent to larger population centers in other states. Asotin and Garfield counties are particularly affected by hospitalization in Idaho.
- No race/ethnicity data are collected.

For Further Information

- Washington State Department of Health, Center for Health Statistics, Hospital Data:
<http://www.doh.wa.gov/ehsphl/hospdata/>

Analyses for this report were completed using Intercooled STATA 11.2.

Confidence Intervals

Confidence intervals (CI) are used to account for the difference between a sample from a population and the population itself. They can also be used to account for uncertainty that arises from natural variation inherent in the world around us. As such, they provide a means of assessing and reporting the precision of a point estimate, such as a mortality or hospitalization rate or the frequency of reported behaviors. Confidence intervals do not account for several other sources of uncertainty, including missing or incomplete data, bias resulting from non-response to a survey, or poor data collection. In this report, we have used confidence levels of 95 percent. This level means that in 95 out of 100 cases, the confidence interval contains the true value. These confidence intervals were generally calculated by multiplying the standard error by 1.96, adding and subtracting the product to and from the point estimate to obtain the upper and lower bounds of the confidence intervals. Because of the nature of the sampling for BRFSS and the Healthy Youth Survey, standard errors for rates or frequencies using these data sources were generated using STATA software, to account for complex sampling designs.

Confidence intervals in this publication are presented graphically. The confidence intervals are shown by the vertical lines, with the upper and lower bounds shown by horizontal lines at each end of the intervals, also referred to as error bars.

Statistically Significant or Detectable Differences

Statistically significant or detectable differences are differences between estimates that are not likely due to chance alone. Detectable differences are identified in this report in a variety of ways.

Some detectable differences can be identified by visually comparing confidence intervals in graphs. When comparing two percentages, if the 95 percent CI of a percentage overlaps the point estimate for the other percentage, the two percentages are **not** statistically significantly different. If the confidence intervals do not overlap, the percentages **are** significantly different.

If the confidence intervals overlap with each other, but not with the point estimates, the two percentages may or may not be significantly different, in which case formal statistical testing for significance was needed to produce a p-value. P-values less than 0.05 indicate that both percentages are statistically significant at the 95 percent confidence level.

In this report, we used the following tests to produce p-values:

- Chi-square tests were done for simple tests of association exposure and outcome variables when both exposure and outcome were binary (for example, asthma [yes, no] and gender [male, female]).
- Linear regression models were used for continuous outcome variables, including ordinal categorical variables (for example, symptom frequency during the past month where reported days were combined into frequency categories).
- Joinpoint analysis (National Cancer Institute, 2010) was used to examine trends over time for smoking during pregnancy and hospitalization data. We report increasing or declining trend for the past 10 years.

Age-Adjusted Rates

Sometimes population characteristics need to be considered when comparing the health status of two groups of people, such as Washington residents and those of the US. Because many health indicators change with age, age is one of the most important characteristics to consider. We usually want to know whether our rate of disease or risk factors is higher or lower than a comparison group independent of the fact that we are older or younger than the comparison group.

Age-adjustment is a method of developing rates that eliminate the impact of different age structures in two populations. Age-adjustment also allows us to compare rates in the same population over a period of time during which the population may have aged. Age-adjusted rates were computed by multiplying the rate for a specific age group in a given population by the proportion of people in the same age group in a standard population and then adding across age groups.

Unless otherwise indicated, all age-adjusted rates in this document have been adjusted to the 2000 US standard population.

Year Standardized Estimate (youth data)

Some youth asthma prevalence is presented as combined single grade estimate (i.e., combining both year 2008 and 2010) using year standardization. Year standardization method weights the data using enrollment information to ensure that each year contributes equally to the overall percent estimate. According to the 2008-2009 and 2009-2010 Washington Office of Superintendent of Public Instruction (OSPI), enrollment data for the state are:

Grade	2008	2010	Total
Grade 6	77,313	78,639	155,952
Grade 8	78,999	78,576	157,575
Grade 10	85,359	82,072	167,431
Grade 12	80,013	84,319	164,332

For each grade, the enrollments for each year are added together to produce a combined enrollment number for the years. Then for each grade and year, the combined enrollment for that grade is divided by the total number of respondents for that specific grade and year. Please see Appendix A: Data Sources for the number of Healthy Youth Survey respondents by year.

STATA commands are:

```
gen yearwt=.
replace yearwt = 155952/11549 if (grade==6 & year==2010)
replace yearwt = 155952/9068 if (grade==6 & year==2008)
replace yearwt = 157575/9723 if (grade==8 & year==2010)
replace yearwt = 157575/8730 if (grade==8 & year==2008)
replace yearwt = 167431/6889 if (grade==10 & year==2010)
replace yearwt = 167431/6907 if (grade==10 & year==2008)
replace yearwt = 164332/5908 if (grade==12 & year==2010)
replace yearwt = 164332/5641 if (grade==12 & year==2008)
```

Grade Standardized Estimate (youth data)

Some youth asthma prevalence is presented as combined single grade estimate (i.e., combining both year 2008 and 2010 and grades) using age standardization. Grade standardization method weights the data using enrollment information to ensure that each year and grade contributes equally to the overall percent estimate. According to the 2008-2009 and 2009-2010 Washington Office of Superintendent of Public Instruction (OSPI), enrollment data for the state are:

Grade	2008	2010	Total
Grade 6	77,313	78,639	155,952
Grade 8	78,999	78,576	157,575
Grade 10	85,359	82,072	167,431
Grade 12	80,013	84,319	164,332
Total	321,684	323,606	645,290

For each grade, the enrollments for each year are added together to produce a combined enrollment number. Then the combined enrollment is divided by the total number of respondents for that specific grade. Please see Appendix A: Data Sources for the number of Healthy Youth Survey respondents by year.

STATA commands are:

```
gen gradewt=
replace gradewt = 64590/20617 if grade==6
replace gradewt = 645290/18453 if grade==8
replace gradewt = 645290/13796 if grade==10
replace gradewt = 645290/11549 if grade==12
```

Definition of Obesity/Overweight

Obesity is an abnormally high amount of body fat in relation to lean body mass. The Centers for Disease Control and Prevention defines obesity in adults as a body mass index (BMI) of 30 or greater. Overweight is defined as a BMI of 25-29.9. Body mass index is based on an individual's height and weight, and is calculated by dividing weight in kilograms by height in meters squared. Of BRFSS respondents: a typical woman 5 feet 5 inches tall with a normal BMI weighed 130 pounds, a typical woman considered overweight based on BMI weighed 160 pounds, and a typical obese woman weighed 200 pounds. A typical man 5 feet 11 inches tall with a normal BMI weighed 160 pounds, a typical overweight man weighed 190 pounds, and an obese man weighed 235 pounds.

Following CDC protocols used in the national Youth Risk Behavior Survey (YRBS), Healthy Youth Survey respondents were classified as "obese" if their weight was above the 95th percentile (although this category is typically named as "overweight" in the YRBS), and "overweight" (called "at risk for overweight" in the YRBS) for the 85-95th percentiles in

BMI from the NHANES normal values determined in the 1970's. There is currently no accepted CDC definition of obesity for children. Names for youth weight categories were changed in this report to make them consistent with adult categories.

Race and Hispanic Ethnicity

Although there are diseases for which "race" and "ethnic group" are markers for genetic factors (such as malignant melanoma or sickle cell anemia), most scientists do not believe that race and ethnicity are biological constructs. Rather, in explaining the relationships of race and ethnicity to human health, race and ethnicity are best viewed as proxies for the effects of complex social, cultural, economic, and political factors.

The U.S. Census Bureau uses the concept of race to reflect self-identification and not to denote any clear-cut scientific definition of biological stock. As with the U.S. Census, race as collected by the systems used to generate data for this document is not intended to denote a clear-cut definition of biological stock. For some systems, the race data reflect self-classification by people according to the race with which they most closely identify. For other systems someone else reports the race of the person. These reports are most likely to reflect the race with which the person most closely identifies when the person reporting the race knows or knew the person well, such as when next-of-kin report race on a death certificate. At times, someone who does not know the person well makes a judgment about the person's race, such as when a health care worker records race in a medical chart without first asking the person. In these instances, the race may not represent that with which the person most closely identifies.

Ethnicity, as used by the U.S. Census Bureau, refers to "the ancestry, nationality group, lineage, or country of birth of the person or the person's parents or ancestors before their arrival in the United States." People of Hispanic or Latino ethnicity have their origins in a Hispanic or Spanish-speaking country such as Mexico or Cuba, or the Spanish-speaking countries of Central or South America. People of Hispanic ethnicity can be of any race.

Following national guidelines, most data systems currently separate Hispanic ethnicity from race. They generally first ask about Hispanic ethnicity. For example, the Behavioral Risk Factor Surveillance system asks, "Are you Hispanic or Latino?" It then asks about race.

Federal guidelines currently specify five racial categories including American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or other Pacific Islander, and white. Until the 1997 revisions, federal guidelines grouped Asians and Pacific Islanders. The 1997 revisions were used in the 2000 U.S. Census, but most states, including Washington, did not adopt these conventions until 2003.

See Guidelines for Using Racial and Ethnic Groups in Data Analyses

<http://www.doh.wa.gov/Portals/1/Documents/5500/RaceEthnGuidelines.pdf> for a more detailed discussion of these issues.

Federal Poverty Level (FPL)

Each year, the U.S. Department of Health and Human Services issues poverty thresholds guidelines for administrative purposes such as determining financial eligibility for federal programs. These guidelines are referred to as the “federal poverty level” (FPL) and take into account household size. To calculate FPL for Washington, we used a midpoint for income ranges from the BRFSS to assign an annual income. In this report FPL is defined as people who are above 200 percent FPL, 100-200 percent FPL (near poor), or below FPL (poor).

**The 2010 Poverty Guidelines for the
48 Contiguous States and the District of Columbia**

Persons in family	Poverty guideline
1	\$10,830
2	14,570
3	18,310
4	22,050
5	25,790
6	29,530
7	33,270
8	37,010
For families with more than 8 persons, add \$3,740 for each additional person	

See the HHS Poverty Guidelines (<http://aspe.hhs.gov/poverty/10poverty.shtml>) for a more information on this issue.

Age-adjustment – A method to standardize populations with different age distributions and allows for comparisons over time; also known as age-standardization. This is particularly important for age-related diseases. Unless otherwise indicated, all age-adjusted rates in this document have been adjusted to the 2000 US standard population.

Body Mass Index (BMI) – A mathematical method to determine body fat in relation to lean body mass by dividing a person's metric weight by the square of the person's metric height. For this report BMI is defined as people who are not overweight ($BMI < 25$), overweight (BMI between $25-29.9$), or obese ($BMI \geq 30$). For youth the cut points for obesity and overweight are based on age and gender specific growth charts developed by the CDC. Individuals in the top 5 percent for BMI based on age- and gender-specific growth charts are considered obese. Those in the top 15 percent, but not the top 5 percent, are considered overweight.

Confidence interval (CI) – An indication of a measurement's precision with a narrow confidence interval indicating high precision and a wide confidence interval indicating low precision. Sometimes called the “margin of error.”

Current asthma – When a survey respondent reports that they have ever been told they have asthma AND they still have asthma at the time they took the survey.

Federal Poverty Level (FPL) – A general term which refers to the federal poverty guidelines, an income level based on the number of people in a family unit. The poverty threshold is calculated annually by the Health and Human Services for administrative purposes, such as determining financial eligibility for federal programs. In this report FPL is defined as people who are above 200 percent FPL, 100-200 percent FPL (near poor), or below FPL (poor).

Lifetime asthma – When a survey respondent reports that they have been told by a doctor, nurse, or other health professional they have asthma.

Prevalence – The percentage of a defined population with a disease at a given time.

Rate – A fraction calculated by dividing the number of people affected by a problem by the number of people at risk of experiencing the problem. Rates are generally expressed in relation to a specific time period and multiplied so that the rate is not expressed as a fraction. In this report we express maternal smoking, hospitalizations, and mortality rates per 100,000 people.

Risk factor – A personal habit or characteristic, clinical condition, or environmental exposure that is associated with an increased probability or severity of disease.

Second-hand smoke (SHS) exposure – Inhalation of air containing tobacco smoke from someone else smoking. Also known as environmental tobacco smoke.

- Adult – defined as smoking occurring in the home in the past 30 days
- Adult Call back – defined as smoking inside the home in the past seven days
- Youth – defined as smoking in a room in the past 30 days

Statistically detectable – An observed difference between two populations is determined to be statistically detectable (significant) if it is unlikely to have occurred randomly or by chance. If there is more than a five percent probability that the differences we see are just due to chance, we say that there is no statistically detectable (or significant) difference.

Surveillance – The ongoing systematic collection, analysis, and interpretation of health data. Surveillance is essential to the planning, implementation, and evaluation of public health practice.

Synthetic high school estimate – A generated high school estimate using grade-adjusted weighting and weights for the non-surveyed grades 9 and 11. The combined estimate also allows for more robust analysis, especially for minority populations.

Tobacco use

- Adult – defined as ever smoked at least 100 cigarettes in their lifetime and currently smoke every day or somedays.
- Youth – defined as smoked a cigarette in the past 30 days

Trigger – A risk factor that causes exacerbations of asthma. Examples of triggers are second hand smoke, exercise, mold, pet dander, etc.

- ¹ Text to define asthma was primarily adapted from the *National Asthma Training Curriculum*, CD-ROM educational resource, Centers for Disease Control and Prevention, National Center for Environmental Health and the Academy of Allergy, Asthma and Immunology, August 2004.
- ² Schraufnagel DE, Kell B, Gelabert D, Hill W, Savoie K, Pack B. 2010. American Thoracic Society. Breathing in America: Diseases, Progress, and Hope. *Asthma*. 3:25 Available online at <http://www.thoracic.org/education/breathing-in-america/resources/breathing-in-america.pdf>. Accessed October 2012.
- ³ *National Asthma Training Curriculum*, CD-ROM educational resource, Centers for Disease Control and Prevention, National Center for Environmental Health and the Academy of Allergy, Asthma and Immunology, August 2004.
- ⁴ Centers for Disease Control Prevention: National Center for Environmental Health Asthma Fact Sheet. Available online at <http://www.cdc.gov/asthma/faqs.htm>. Accessed July 2012.
- ⁵ Centers for Disease Control and Prevention, 2012. Asthma's Impact on the Nation. Available online at http://www.cdc.gov/media/releases/2012/p0515_asthma_impact.html. Accessed October 2012.
- ⁶ Data Source: Washington Behavioral Risk Factor Surveillance System, Adult Asthma Callback Surveys, 2008-2010.
- ⁷ Data Source: Comprehensive Hospital Abstract Reporting System, 2010.
- ⁸ Data Source: Washington State Healthy Youth Survey, 2010.
- ⁹ Centers for Disease Control and Prevention, 2010 Adult Asthma Data: Prevalence Tables and Maps. Available online at www.cdc.gov/asthma/brfss/2010/brfssdata.htm. Accessed March 2012
- ¹⁰ Data Source: Washington State Department of Health, Center for Health Statistics, Behavioral Risk Factor Surveillance System, supported in part by Centers for Disease Control and Prevention, Cooperative Agreement U58/CCU022819 and DP001996-1
- ¹¹ Akinbami L, Moorman J, Liu X, et al. 2011. Asthma prevalence, health care use, and mortality: United States, 2005-2009. *Natl Health Stat Report*. 12;(32): 1-14. Available online at <http://www.cdc.gov/nchs/data/nhsr/nhsr032.pdf>. Accessed March 2012.
- ¹² Rhodes L, Moorman JE and Reed SC. 2005. Sex differences in asthma prevalence and other disease characteristics in eight states. *J Asthma*. 42:777-782.
- ¹³ Carey M, Card JW, Voltz JW, et al. 2007. It's all about sex: gender, lung development and lung disease. *Trends Endocrinol Metab*. 18(8):308-13. Available online at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2391086/>. Accessed March 2012.
- ¹⁴ Caracta CF. 2003. Gender Differences in Pulmonary Disease. *Mt Sinai J Med*. 70:215-224.
- ¹⁵ Melgert BN, Ray A, Hylkema MN, et al. 2007. Are There Reasons Why Adult Asthma Is More Common in Females? *Curr Allergy Asthma Rep*. 7:143-150.
- ¹⁶ Chittleborough CR, Taylor AW, Grande ED, Gillet al. 2010. Gender Differences in Asthma Prevalence: Variations with Socioeconomic Disadvantage. *Respirology*. 15:107-114.
- ¹⁷ Conron KJ, Mimiaga MJ, and Landers SJ. 2010. A population-based study of sexual orientation identity and gender differences in adult health. *Am J Public Health*. 100(10):1953-60.
- ¹⁸ Steele LS, Ross LE, Dobinson C, et al. 2009. Women's Sexual Orientation and Health: Results from a Canadian Population-Based Survey. *Women Health*. 49:353-367.
- ¹⁹ Crimmins EM, Hayward MD, and Seeman TE. Race/Ethnicity, Socioeconomic Status, and Health. In: Anderson NB, Bulatao RA, Cohen B, eds. *Critical Perspectives on Racial and Ethnic Differences in Health in Late Life*. Washington (DC): National Academies Press (US); 2004. Accessed 2/5/13, http://www.nap.edu/openbook.php?record_id=11086&page=310
- ²⁰ Washington State Department of Health. Washington Tobacco Facts – 2011. Available online at <http://www.doh.wa.gov/DataandStatisticalReports/HealthBehaviors/Tobacco/AssessmentandEvaluation/CountyData/WashingtonState.aspx>. Accessed March 2012.
- ²¹ Centers for Disease Control and Prevention, Asthma Data and Surveillance. Current asthma Prevalence by Age, Sex, and Race, United States, 2010. Available online at <http://www.cdc.gov/asthma/asthmadata.htm>. Accessed March 2012.
- ²² Nicolai T, Pereszlenyiova-Bliznakova L, Illi S, Reinhardtet al. 2003 Longitudinal follow-up of the changing gender ratio in asthma from childhood to adulthood: role of delayed manifestation in girls. *Pediatr Allergy Immunol*. 14:280–283.
- ²³ Osman M, Tagiyeva N, Wassall HJ, et al. 2007. Changing trends in sex specific prevalence rates for childhood asthma, eczema, and hay fever. *Pediatr Pulmonol*. 42:60-65.

- ²⁴ Vink NM, Postma DS, Schouten JP, et al. 2010. Gender differences in asthma development and remission during transition through puberty: The TRacking Adolescents' Individual Lives Survey (TRAILS) study. *J Allergy Clin Immunol.* 126(3):498-504.
- ²⁵ Air Quality System (AQS), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, accessed online through the Washington Tracking Network <https://fortress.wa.gov/doh/wtn/WTNPortal/default.aspx>.
- ²⁶ U.S. Department of Health Human Services. *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking – Attributable Disease. A report of the Surgeon General.* Atlanta, GA: Centers for Disease Control and Prevention, 2010. Available online at <http://www.surgeongeneral.gov/library/tobaccosmoke/index.html>. Accessed March 2012.
- ²⁷ U.S. Department of Health Human Services. *Preventing Tobacco Use Among Youth and Young Adults: A report of the Surgeon General.* Atlanta, GA: Centers for Disease Control and Prevention, 2012. Available online at <http://www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/full-report.pdf>. Accessed March 2012.
- ²⁸ Beuther DA. 2010. Recent insight into obesity and asthma. *Curr Opin Pulm Med.* 16(1):64-70.
- ²⁹ Shore, S.A. 2008. Obesity and asthma: possible mechanisms. *J Allergy Clin Immunol.* 121:1087-1093.
- ³⁰ Institute of Medicine. Clearing the Air: Asthma and Indoor Air Exposures. Washington, DC: National Academy Press, 2000.
- ³¹ Etzel RA. 2003. How environmental exposures influence the development and exacerbation of asthma. *Pediatrics.* 112(1):233-39.
- ³² Institute of Medicine. Damp Indoor Spaces and Health. Washington DC: National Academies Press; 2004. Available online at <http://www.nap.edu/catalog/11011.html>. Accessed March 2012.
- ³³ Data Source: Washington Behavioral Risk Factor Surveillance System, Child Asthma Callback Survey, 2009-2010; children 0-17 years old.
- ³⁴ Toren K. and Blanc DP. 2009. Asthma caused by occupational exposure is common – A systematic analysis of estimates of the population attributable fraction. *MNC Pulm Med.* 9:7.
- ³⁵ Lombardo LJ, Balmes JR. 2000. Occupational asthma: a review. *Environ Health Perspect.* 108(Suppl. 4):697-704.
- ³⁶ Data Source: Washington State Healthy Worksite Survey, 2008.
- ³⁷ Yang Q, Chen Y, Shi Y, Burnett RT, McGrail KM, Krewski D. 2003. Association between ozone and respiratory admissions among children and the elderly in Vancouver, Canada. *Inhalation Toxicology.* 15(13): 1297-13208.
- ³⁸ Yu O, Sheppard L, Lumley T, Koenig JQ, Shapiro GG. 2000. Effects of ambient air pollution on symptoms of asthma in Seattle – Area children enrolled in the CAMP study. *Environ Health Perspect.* 108(12) 1209-1214.
- ³⁹ Slaughter JC, Lumley T, Sheppard L, Koenig JQ, Shapiro GG. 2003. Effects of ambient air pollution on symptom severity and medication use in children with asthma. *Ann Allergy Asthma Immunol.* 91: 346-353.
- ⁴⁰ Washington Air Quality Advisory (WAQA), Washington Department of Ecology, accessed online through the Washington Tracking Network <https://fortress.wa.gov/doh/wtn/WTNPortal/default.aspx>.
- ⁴¹ US Department of Health and Human Services, National Institute of Health, National Heart, Lung, and Blood Institute. Expert Panel Report 3: guidelines for the diagnosis and management of asthma. Available online at: <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf>. Accessed October 2012.
- ⁴² US Department of Health and Human Services, National Center for Health Statistics. National Hospital Discharge Survey, 2010. Available online at <http://www.cdc.gov/nchs/nhds.htm>. Accessed October 2012
- ⁴³ Peters SP, Ferguson G, Deniz Y, Reisner C. Uncontrolled asthma: a review of the prevalence, disease burden and options for treatment. *Respir Med.* 2006;100(7):1139-1151.
- ⁴⁴ DeFrances CJ, Cullen KA, Kozak LJ. 2007. National Hospital Discharge Survey: 2005 Annual Summary with Detailed Diagnosis and Procedure Data. National Center for Health Statistics. Vital Health Statistics 13 (165).
- ⁴⁵ Weiss, K.B. 1990. Seasonal Trends in U.S. Asthma Hospitalizations and Mortality. *JAMA.* 263(17):2323-2328.
- ⁴⁶ Erickson SE, Iribarren C, Tolstykh IV, Blanc PD, Eisner MD. Effect of Race on Asthma management and Outcomes in a Large, Integrated Managed Care Organization. *Arch Intern Med.* 2007;167(17):1846-1852.
- ⁴⁷ Tran HN, Suis S, Iribarren C, Udaltsova N, Klatsky AL. Ethnicity and risk of hospitalization for asthma and chronic obstructive pulmonary disease. *Ann Epidemiol.* 2011;21(8): 615-622
- ⁴⁸ Ash M, Brandt S. Disparities in Asthma Hospitalization in Massachusetts. *Am J Public Health.* 2006;96(2):358-362.
- ⁴⁹ Washington State Department of Health, Center for Health Statistics, Death Certificate Data, 1990-2010. Accessed September 2011
- ⁵⁰ Minino A, Murphy S, Xu J, and Kochanek K. Deaths: 2011. Deaths: Final Data for 2008. *Natl Vital Stat Rep.* 59(10):1-155.

⁵¹ Arias E, Schauman WS, Eschbach K, Sorlie PD, Backlund E. 2008. The validity of race and Hispanic origin reporting on death certificates in the United States. *Vital Health Stat 2*. 148:1-23