

The Burden of Asthma in Montana, 2013

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Acronyms

AAP	Asthma Action Plan
ACBS	Asthma Call-Back Survey
ACT	Asthma Control Test
AI	American Indian
ASME	Asthma Self-Management Education
BMI	Body Mass Index
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
CLRD	Chronic Lower Respiratory Disease
DPHHS	Department of Public Health and Human Services
ED	Emergency Department
EPA	Environmental Protection Agency
EPR-3	Expert Panel Report 3
ETS	Environmental Tobacco Smoke
HP2020	Healthy People 2020
HCP	Health Care Provider
HS	High School
ICD	International Classification of Disease
ICS	Inhaled Corticosteroid
MACP	Montana Asthma Control Program
MAAG	Montana Asthma Advisory Group
MMHCDS	Montana Medicaid Health and Chronic Disease Survey
MHDDS	Montana Hospital Discharge Data System
MHA	Montana Hospital Association
MOVS	Montana Office of Vital Statistics
NAAQS	National Ambient Air Quality Standards
NHLBI	National Heart, Lung, and Blood Institute
OA	Occupational Asthma
PM _{2.5} and PM ₁₀	Particulate Matter, 2.5 micron and 10 micron
SABA	Short-Acting Beta ₂ -Agonists
YRBS	Youth Risk Behavior Survey
YPLL	Years of Potential Life Lost

Executive summary

- Asthma is prevalent in Montana.
 - 9.1% and 6.9% of adults and children, respectively, report having current asthma.
 - The prevalence of asthma has not changed significantly in the last decade in this state.
- Asthma is a serious health condition.
 - Half of adults and one third of children aged less than 18 years with asthma have either not well controlled or very poorly controlled asthma based on Expert Panel Review (EPR-3) guidelines.
 - Significantly more adults with uncontrolled asthma self-reported fair or poor health status and dissatisfaction with life compared with adults with well-controlled asthma
- Disparities in asthma prevalence exist in Montana.
 - Females have a higher prevalence of asthma than do males.
 - People who are overweight or obese have a higher prevalence of asthma than do those of normal weight.
 - People with lower educational attainment and lower incomes have higher prevalence of asthma than do people of higher educational level and higher household incomes, respectively.
 - Controlling for these disparities, White and American Indian residents of Montana have similar prevalence of asthma.
- Some asthma triggers are more common in Montana than others.
 - Smoke from wildfires and wood burning stoves can leave particulate matter in the air that aggravates asthma.
 - People with asthma smoke tobacco at higher rates than do people without asthma.
- More can be done to improve the lives of people with asthma in Montana.
 - The Montana Asthma Control Program and its partners are implementing several programs around the state to address asthma in schools, daycare settings, and the home; to train providers on asthma care guidelines; to provide tools that will help inform clinical decisions; and to guide clinical care and conduct statewide surveillance of asthma.
 - Montanans with asthma reported having received standard asthma self-management education infrequently. Adults with asthma aged 18-64 years and enrolled in Medicaid report having seen health care providers at higher frequencies than all adults aged 18-64 with asthma; yet still do not report having received more education.
 - Evidence-based, effective programs addressing asthma could be expanded throughout the state to reach more people with asthma and empower them to self-manage their asthma.

Introduction

Asthma is a chronic inflammatory disease of the airways characterized by episodic symptoms of wheezing, shortness of breath, coughing, and chest tightness. Asthma affected 26 million people in the United States (US) in 2010 and led to approximately \$56 billion in health care costs.[1]

Because asthma is a serious public health concern, the US Department of Health and Human Services has made the control and management of asthma a national priority and has included eight asthma-related objectives in the Healthy People 2020 (HP 2020) framework. The Montana Department of Public Health and Human Services (DPHHS) supports these objectives and is committed to addressing asthma comprehensively in Montana. In 2007, the Montana state legislature provided funding for asthma control, allowing DPHHS to create the Montana Asthma Control Program (MACP). In 2009, the MACP was awarded a five-year grant from the Centers for Disease Control and Prevention (CDC) to support Montana's efforts in asthma control. The MACP is responsible for developing an asthma surveillance system for the state and for coordinating a statewide asthma control effort. The MACP efforts are guided by a state plan developed in conjunction with asthma control partners involved in the Montana Asthma Advisory Group (MAAG).

To address asthma issues in Montana, it is important to understand the state's unique characteristics including:

- Rural residence: Though Montana is a large state in terms of land area, the total population in 2011 was 998,199 and the population density was only 6.9 persons per square mile.[2]
- Metro/micropolitan counties: 10 of Montana's 56 counties are classified as either metropolitan or micropolitan counties. A metropolitan area contains a city of more than 50,000 people and a micropolitan area contains an urban core of at least 10,000, but less than 50,000 people. In 2009 there were three metropolitan counties in Montana, the largest with a population of 147,972.[3]
- Rural counties: 46 counties in Montana are not metro/micropolitan. About a third of Montana's population lives in one of these rural counties.[3]
- Indian Reservations: There are seven American Indian reservations and 12 tribes in Montana. Each reservation has a sovereign tribal government. American Indians comprise 7.5% of Montana's population and are the state's largest minority group.[2]

Because of Montana's unique blend of American Indian tribal areas, small cities, and vast frontiers, an effective asthma control plan in the state will require a diverse approach that considers the needs and opportunities for intervention in each area of the state.

Other Factors Related to Asthma in Montana

- Household income: Asthma affects persons of low income disproportionately. Montana's median household income is almost 12% lower than the median income for the US as a whole

(\$44,222 vs. \$50,502). In 2011, the median household income for American Indians in Montana is \$29,951 compared with \$45,501 for whites.[4]

- Health insurance: Adequate insurance coverage is essential for individuals with asthma to adequately manage their chronic disease. In 2010, 18.4% (95% confidence interval (CI) 16.7%-20.4%) of Montanans reported having no health insurance coverage compared to the median national rate of 15.0%.[5]
- Obesity and overweight: Being overweight or obese is associated with higher prevalence of asthma.[6] In Montana, 61.3% (95% CI 59.2%-63.3%) of adults are overweight or obese, similar to the national median of 63.7%.[5]
- Smoking: Exposure to tobacco smoke and personal smoking can exacerbate asthma symptoms and trigger asthma attacks. In 2010, 18.8% (95% CI 17.1%-20.5%) of adults in Montana were current smokers. American Indians in Montana report smoking at higher rates than Whites. Nearly half (48.7%, 95% CI 41.0%-56.5%, BRFSS, 2010) of American Indians adults reported currently smoking tobacco.
- Environmental factors: As a rural state, Montana does not have many of the air quality concerns that confront urban areas. However, the state does have a significant number of wildfires, with an average of 1500 fires reported annually between 2006 and 2011.[7] Wildfires can produce large amounts of particulate matter (PM), which can exacerbate asthma symptoms. Atmospheric inversions, especially in winter months in Montana, can lead to trapped cold air at the earth's surface. Consequently, an increased concentration of air pollutants can also be trapped at the surface.

Brief methods

This burden report is the MACP's summary document that systematically compiles existing data related to asthma in Montana. Data sources used in this report include:

- Behavioral Risk Factor Surveillance System (BRFSS)
- Youth Risk Behavior Survey (YRBS)
- Montana Hospital Discharge Data System (MHDDS)
- Montana Medicaid Health and Chronic Disease Survey (MMHCDS)
- Montana Office of Vital Statistics (MOVS)
- Medicaid administrative claims data
- Montana Tobacco Quit Line

This burden report will be used by the MACP, in concert with stakeholders from Montana, to inform the statewide asthma control plan. The plan promotes healthcare consistent with evidence-based guidelines, empowers patients to self-manage their disease, reduces and controls environmental triggers, implements asthma education in schools and childcare facilities, and promotes community

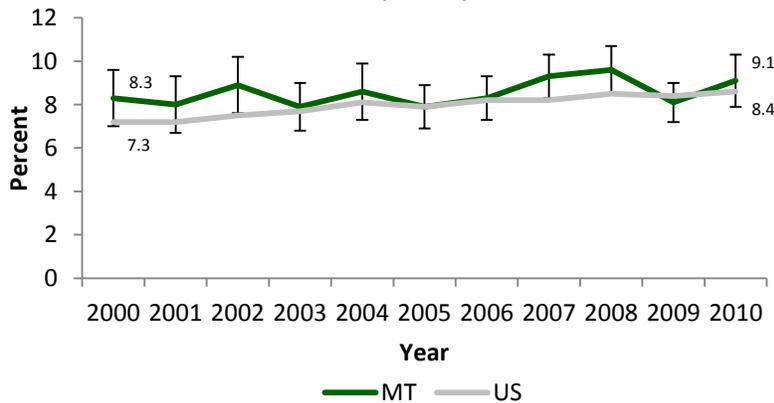
involvement as well as develops asthma policy. All of these efforts will be aimed at accomplishing the overall goal of the MACP to improve the quality of life for all Montanans with asthma.

Asthma prevalence

Asthma in adults

The prevalence of asthma in Montana is measured using the BRFSS survey. Respondents are asked two questions: if a health care provider (HCP) has ever diagnosed them with asthma, and whether they still have asthma. Therefore, prevalence of asthma is dependent on the respondents being told they have asthma and on their saying they still have asthma. Between 2001 and 2010, the prevalence of asthma in adults increased from 7.3% to 8.4% in the US and affected an estimated 19 million adults at the end of the decade.[8] In Montana in 2010, asthma affected an estimated 69,000 adults (9.1%). There has been no significant change in asthma prevalence in Montana in the last decade (Figure 1).

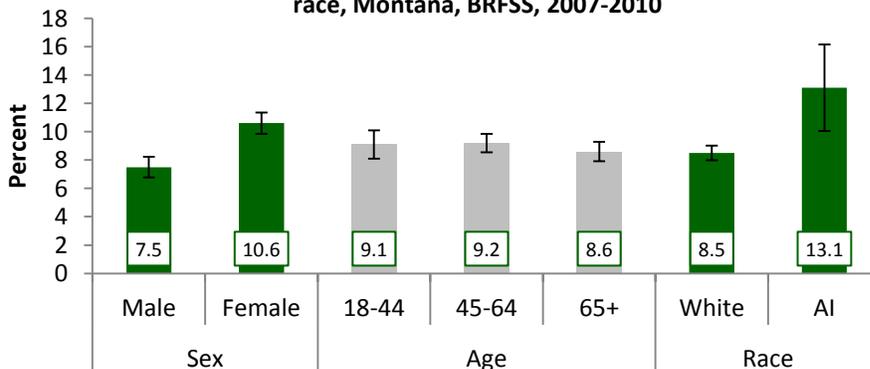
Figure 1. Percent of adults with current asthma by year, US & Montana, BRFSS, 2000-2010



I=95% confidence interval

In Montana, as in the US as a whole, the prevalence of asthma is higher in adult females than in males (Figure 2). There was no significant difference in asthma prevalence among age groups. American Indians had a higher prevalence of asthma than did Whites.

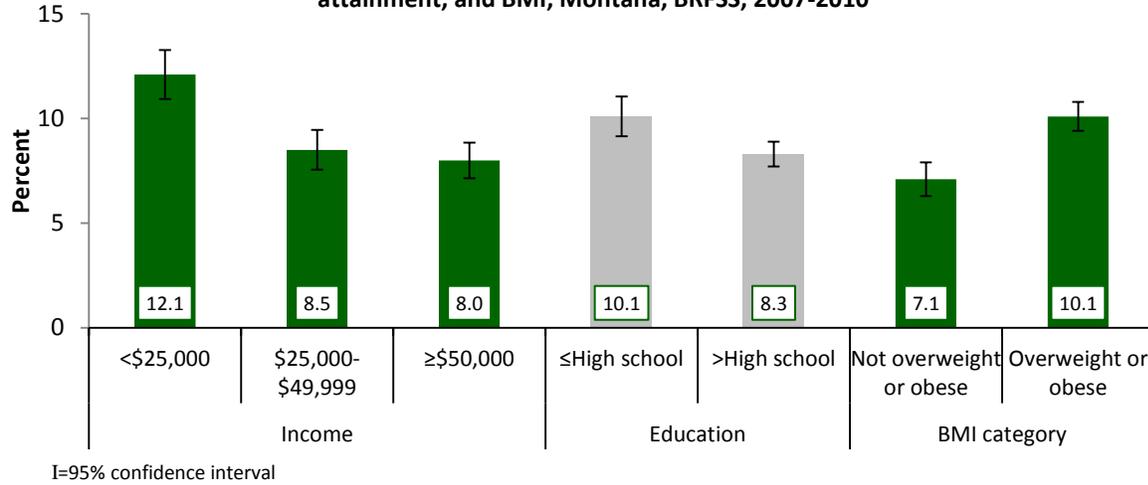
Figure 2. Percent of adults with current asthma by sex, age, and race, Montana, BRFSS, 2007-2010



I=95% confidence interval

Adults with lower household incomes, lower educational attainments, and a body mass index (BMI) in the overweight or obese category had significantly higher prevalence of asthma than those of higher incomes, education, and a BMI not in the overweight or obese category, respectively (Figure 3).

Figure 3. Percent of adults with current asthma by income, educational attainment, and BMI, Montana, BRFSS, 2007-2010



Many factors influence asthma. To measure which factors were independently associated with having asthma, multiple logistic regression was performed to ascertain which characteristics were independently associated with asthma. Female sex, earning a household income of less than \$25,000, being a current smoker, and being overweight or obese were independently associated with having current asthma (Table 1).

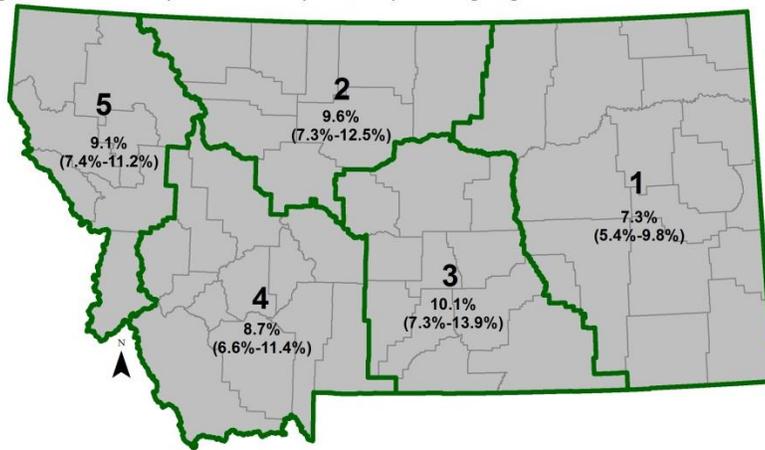
Table 1: Factors independently associated with adults having current asthma, Montana, BRFSS, 2007-2010

	Adjusted Odds Ratio	95% confidence interval
Male	1.0 (reference)	
Female	1.55	1.35-1.80 ‡
<\$25,0000	1.32	1.10-1.59 ‡
\$25,000-\$49,999	0.98	0.82-1.17
≥\$50,000	1.0 (reference)	
White, non-Hispanic	1.0 (reference)	
American Indian, non-Hispanic	1.20	0.87-1.67
Age 18-44 years	1.0 (reference)	
Age 45-64 years	0.98	0.84-1.14
Age ≥65 years	0.91	0.77-1.08
More than HS degree	1.0 (reference)	
HS degree or less	1.13	0.97-1.31
Non-smoker	1.0 (reference)	
Current smoker	1.26	1.05-1.52 ‡
Not overweight or obese	1.0 (reference)	
Overweight or obese	1.58	1.35-1.84 ‡

‡ Statistically significantly different from reference category

There was no difference in adult asthma prevalence by regions in the state (Figure 4).

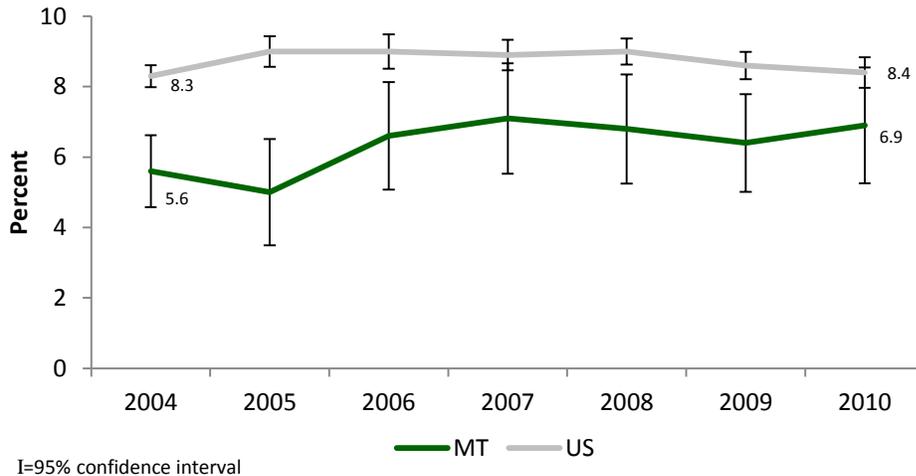
Figure 4. Asthma prevalence by health planning region, Montana, BRFSS, 2010



Asthma in children

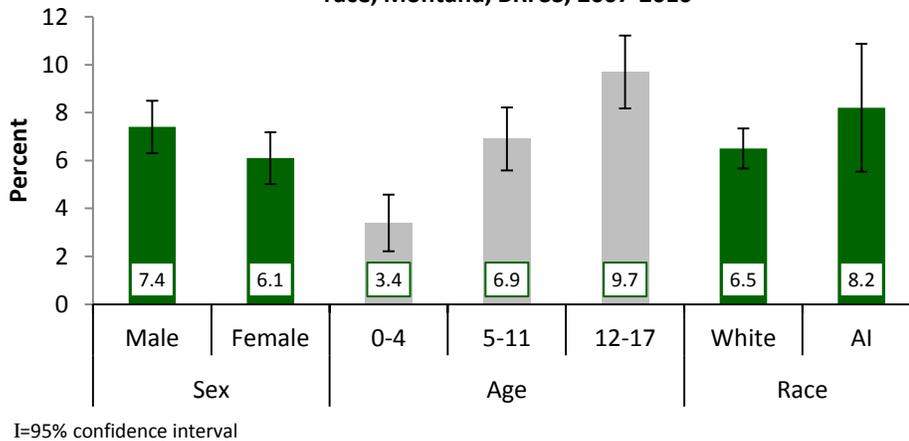
Between 2004 and 2010, the prevalence of asthma in children less than 18 years old remained unchanged in the US and affected an estimated 7 million children at the end of the decade.[8] In Montana in 2010, asthma affected an estimated 15,000 children (6.9%, BRFSS). There was no significant change in asthma prevalence in Montana between 2004 and 2010 (Figure 5). The prevalence of asthma among children in Montana has consistently been lower than the US prevalence.

Figure 5. Percent of children who have current asthma by year, US & Montana, BRFSS, 2004-2010



Montana children between the ages of birth and four years have a significantly lower prevalence of asthma compared with other age groups. This is not surprising because most children do not receive a definitive diagnosis of asthma until after their fifth birthday. There were no significant differences in asthma prevalence among children in Montana by sex or race (Figure 6).

Figure 6. Percent of children with current asthma by sex, age, and race, Montana, BRFSS, 2007-2010



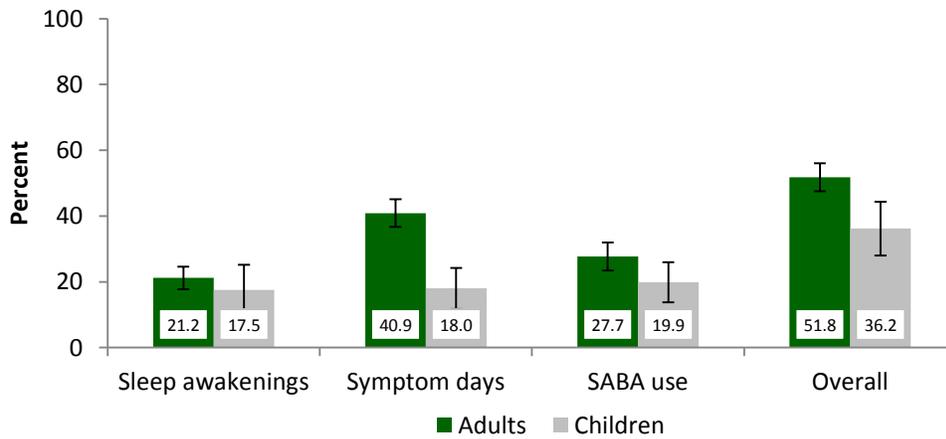
Asthma control and symptoms

Lack of asthma control is associated with decreased quality of life and increased health care utilization.[9] The Expert Panel Review (EPR-3) Guidelines recommend that asthma control be monitored regularly. Control is classified into three categories--well controlled, not well controlled, and very poorly controlled-- based on the number of days per week a person experienced specific asthma symptoms (sleep awakenings, daytime symptoms, interference with normal activity, and use of short acting beta agonist, SABA) in the last four weeks, or their lung function test results.

Activity limitation is measured over the last year rather than the last 30 days in the Asthma Call-back Survey and therefore does not fit the same guidelines as an Asthma Control Test. Activity limitations and lung function testing results have been left out of the calculated asthma control algorithm presented here for the estimation of uncontrolled asthma. Excluding activity limitations from the algorithm likely causes an underestimation of uncontrolled asthma.

Figure 7 shows the percent of adults and children with uncontrolled asthma (either not well or very poorly controlled asthma) based on any one symptom and overall, which was defined as not well controlled or very poorly controlled based on one or more symptom. Most adults were classified as having uncontrolled asthma on the basis of three or more days with symptoms in a week. About half of adults and a third of children with asthma have uncontrolled asthma.

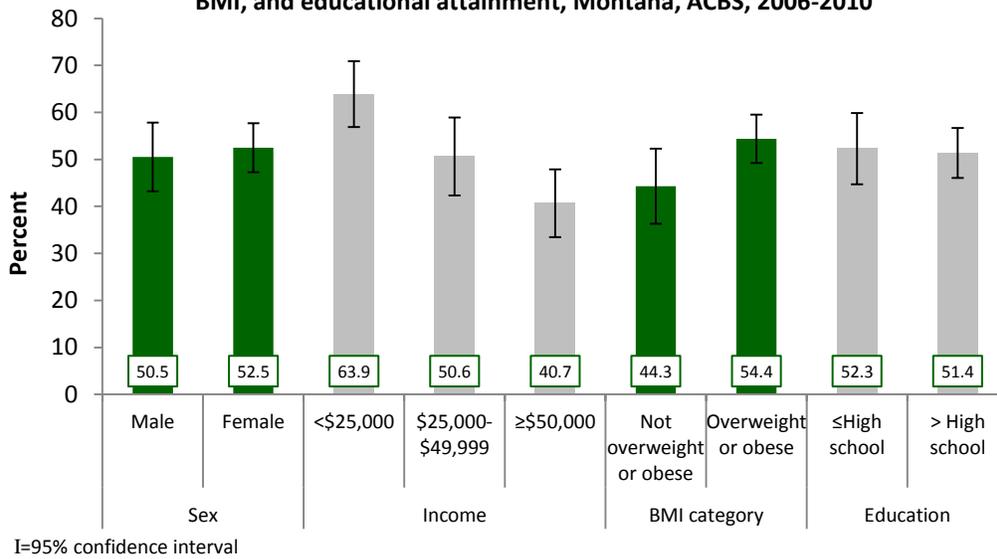
Figure 7. Percent of adults and children with uncontrolled asthma, by symptom and overall, Montana, ACBS, 2006-2010



I=95% confidence interval
 Sleep awakenings: >2 nights per month
 Symptom days: >2 days per week
 SABA use: >2 days per week (excluding before exercise)
 Overall: one or more of these indicators

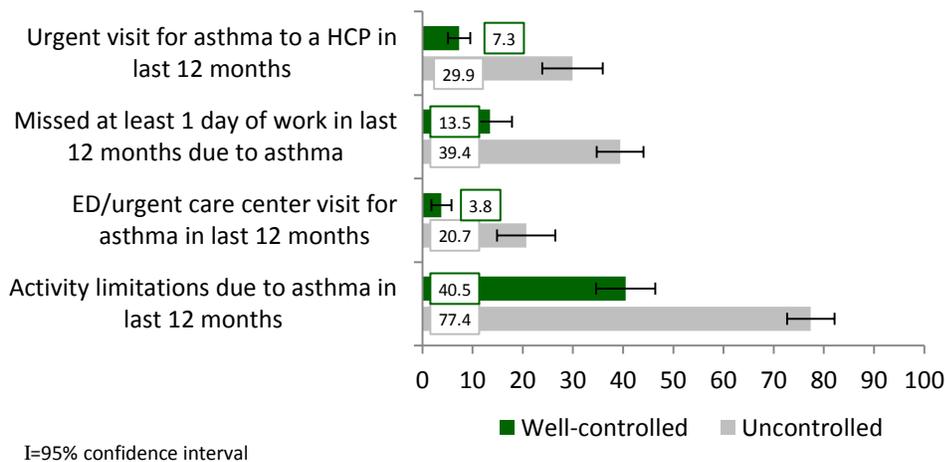
There were no differences in the prevalence of uncontrolled asthma by sex, BMI category, or educational attainment (Figure 8). Uncontrolled asthma was significantly more prevalent among people with household incomes less than \$25,000 per year than among those with incomes of \$50,000 per year or more.

Figure 8. Percent of adults with uncontrolled asthma by sex, income, BMI, and educational attainment, Montana, ACBS, 2006-2010



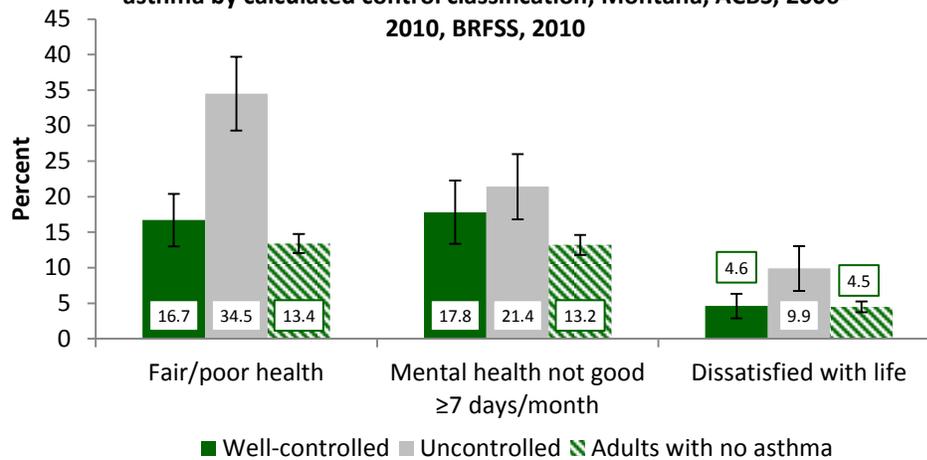
Adults with uncontrolled asthma experienced more severe health outcomes than people with well-controlled asthma. Adults with uncontrolled asthma more frequently had urgent visits to a HCP for their asthma; missed at least one day of work in the last 12 months due to asthma; had to visit Emergency Departments (ED) or urgent care centers for worsening asthma symptoms; and limited their activities due to asthma more often than did adults with well-controlled asthma (Figure 9).

Figure 9. Health outcomes for adults with current asthma by calculated control classification, Montana, ACBS, 2006-2010



Significantly more adults with uncontrolled asthma reported that their health status was fair or poor, and reported dissatisfaction with life, compared to adults with well-controlled asthma (Figure 10). There were no differences in mental health by asthma control status. Adults with well-controlled asthma reported experiencing these three quality of life measures at similar frequencies as did adults without asthma.

Figure 10. Self-reported quality of life among adults with current asthma by calculated control classification, Montana, ACBS, 2006-2010, BRFSS, 2010



I=95% confidence interval

Asthma triggers

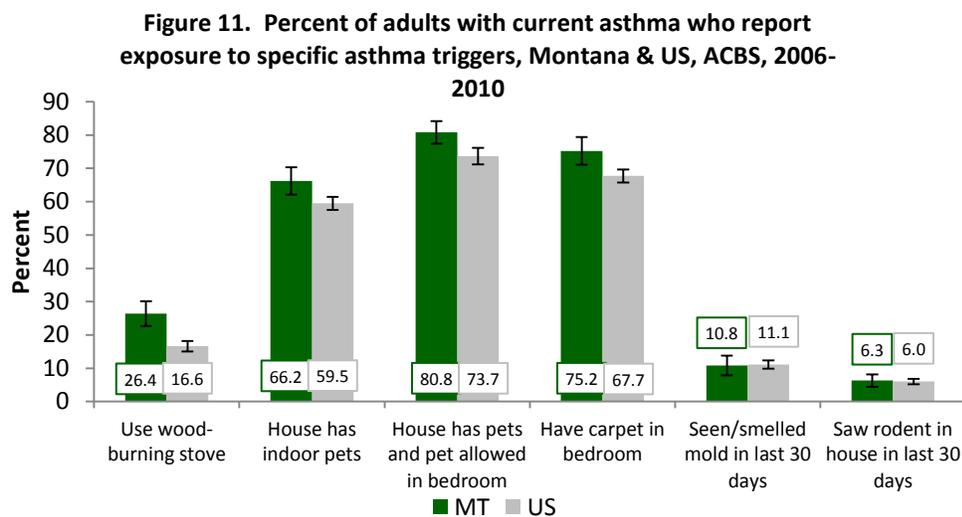
Many known asthma triggers exist in Montana. Starting in October 2010, the MACP coordinated a group of stakeholders to assess and identify the most important asthma triggers in Montana. More specifically, the report focuses on environmental asthma triggers, defined as asthma triggers which one may be exposed to specifically in the indoor or outdoor environment, or in the workplace and excluded triggers like respiratory illnesses (Table 2).[10]

Table 2. Indoor asthma triggers, Montana [10]

Trigger	Present in MT	Associated with:
Tobacco smoke	Yes	Tobacco use
PM _{2.5} or PM ₁₀	Yes	Wood stoves
Mold	Yes	Indoor dampness
Furry and feathered pets	Yes	Pets that spend time indoors, especially in bedrooms and on carpets
Nitrogen Dioxide	Yes	Unvented gas stoves or fireplaces
Dust mites	Limited	Carpets, bed linens, stuffed animals
Rodents	Yes	Unsanitary indoor environments (can affect any home)
Cockroaches	Very limited	Warm, humid climates
Ozone	Yes	Ionizing air purifiers, copy machines
Volatile Organic Compounds	Yes	Strong fragrances, new furnishings and finishes, some air fresheners

Asthma triggers are unique to each individual. Having knowledge of personal asthma triggers can help a person manage their disease and avoid potentially severe exacerbations. The prevalences of some common asthma triggers among adults who report having current asthma are shown in Figure 11. Two-thirds of adults with asthma report having pets in their home and 80.8% of them allow their pets in their bedroom. Pet dander can accumulate in bedding and carpet and lead to worse symptoms at night. Furthermore, pets are so ubiquitous in the US that pet dander may be found in almost all homes, even those with no pets present.[10] One quarter of adults with asthma have wood-burning stoves in their homes. Older stoves release small particles in fine and coarse sizes, called particulate matter (PM_{2.5} and PM₁₀), that can exacerbate asthma. While mold and rodents are also asthma triggers, adults with current asthma in Montana report exposure to these triggers less frequently than other triggers. Cockroaches are not common in Montana and are not likely to be a significant asthma trigger for those living in the state.

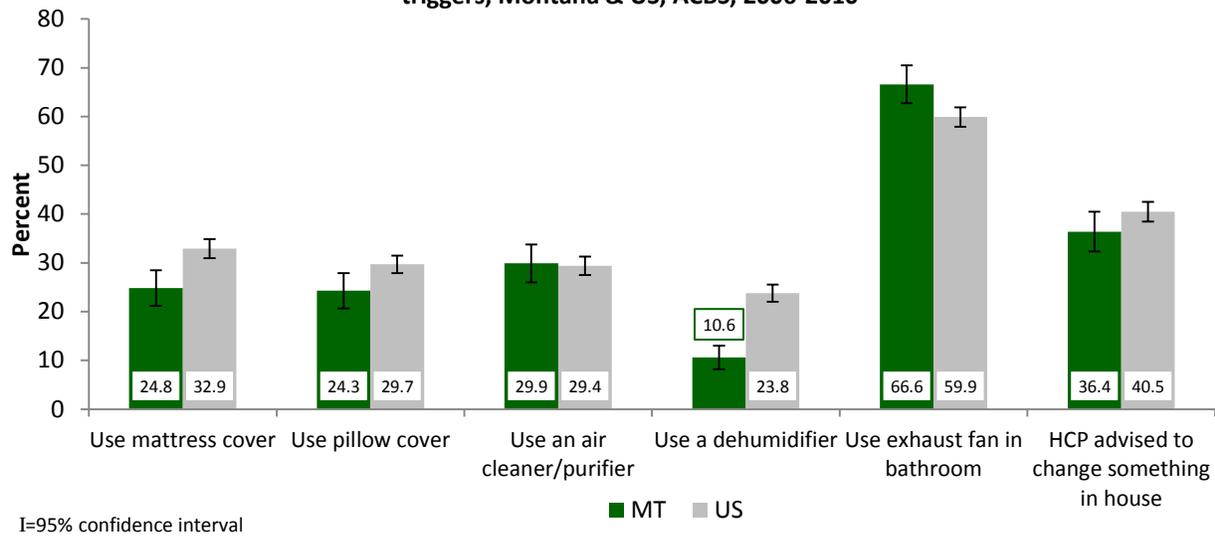
Adults with current asthma in Montana reported using wood-burning stoves, having indoor pets, and allowing pets in their bedrooms and having carpet in their bedrooms more often than adults with current asthma in the nation (Figure 11).



I=95% confidence interval

There are several ways to mitigate or avoid asthma triggers. The most frequently reported mitigation action was to use the exhaust fan in the bathroom (Figure 12). A little more than a third of Montana adults with current asthma reported that HCPs discussed changing something in their houses in order to avoid specific asthma triggers. EPR-3 guidelines recommend that health care providers regularly discuss trigger avoidance with patients. Adults in Montana reported using mattress covers or dehumidifiers less often than adults with asthma in the US as a whole, but reported using bathroom exhaust fans more often.

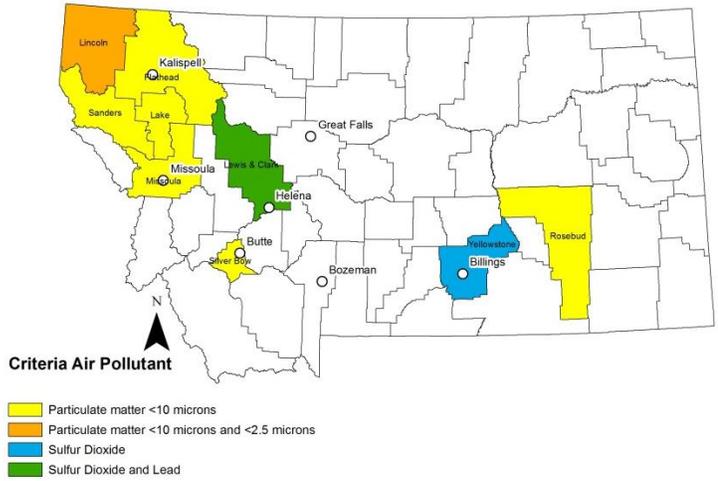
Figure 12. Percent of adults with current asthma who take actions to avoid asthma triggers, Montana & US, ACBS, 2006-2010



There are fewer sources of data on outdoor asthma triggers, but many are of importance as well.[10] Pollen from trees, grasses, and weeds are common asthma triggers in Montana (Table 3). However, there are limited data on how many Montanans’ asthma is triggered by pollen. Cold, dry air can cause bronchoconstriction in susceptible individuals, often in conjunction with exercise. Cold air can contribute to atmospheric inversions in western Montana that trap air pollutants at ground level. However, there is no concrete link between inversions and exacerbations of asthma.

There are six common criteria air pollutants: particulate matter, sulfur dioxide, nitrogen dioxide, ozone, carbon monoxide, and lead. Carbon monoxide and lead are of low concern for exacerbating asthma. Fine and coarse particulate matter (PM_{2.5} and PM₁₀), respectively, are major outdoor air pollutants and may also be indoor pollutants. Seven areas in Montana are designated by the Environmental Protection Agency (EPA) as nonattainment areas (geographic areas that have not consistently met the clean air levels set by the EPA) for PM (Figure 13). PM_{2.5} is produced by wildfires and woodstoves and found in vehicle exhaust. These small particles can settle in the lungs and have been linked with asthma exacerbations.[10] Sulfur dioxide (SO₂) is formed during the combustion of coal and petroleum. A common source of SO₂ is vehicle exhaust, but it is of limited concern in Montana since the population density is low. Short-term exposure to SO₂ has been linked to respiratory tract irritation and the effect can be more pronounced when the individual is exposed to dry, cold air. In 2011, there were two listed nonattainment areas in Montana for SO₂. However, East Helena came into compliance with National Ambient Air Quality Standards (NAAQS) in 2011 and though administratively it is still listed as a nonattainment area; the area is no longer of concern for SO₂.

Figure 13. Nonattainment Areas for Criteria Air Pollutants, Montana, 2012



Nitrogen dioxide (NO₂) is produced during combustion, including motor vehicles, power plants, and wildfires. Reducing vehicular traffic in large urban areas has been linked to decreased asthma symptoms, which may partially be due to NO₂. There are no nonattainment areas in Montana for NO₂, and exposure risk in Montana is low.

Ozone is the primary component of photochemical smog caused by vehicles, industries, and power plants that can lead to respiratory irritation. There are no nonattainment areas in Montana for ozone and ozone is not considered a pollutant of concern in Montana.

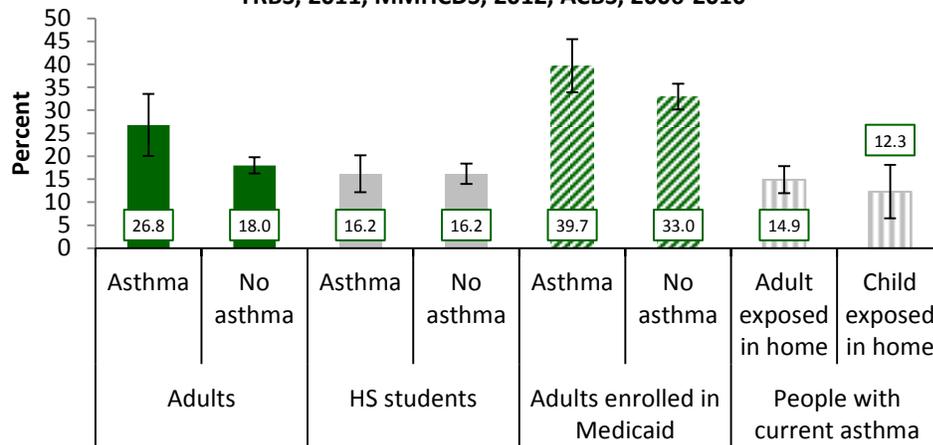
Table 3: Outdoor asthma triggers, Montana [10]

Trigger	Present in MT	Associated with:
PM _{2.5} or PM ₁₀	Yes	Wildfires, wood stoves, western Montana valleys during atmospheric inversion conditions
Wildfires	Yes	Summer months during wildfire season
Cold air	Yes	Winter, low temperatures
Pollen	Yes	Spring, summer, and fall seasons, areas with juniper, alder, birch, poplar, ash, and maple trees, areas with grass and weeds
Sulfur dioxide	Limited	Fossil fuel combustion, especially combustion associated with industry
Nitrogen dioxide	Yes	Wildfires, air pollution
Ozone	Limited	Air pollution

Tobacco

Both smoking and exposure to second-hand smoke are asthma triggers. In spite of this, smoking was more prevalent among adults with current asthma than those without asthma (Figure 14). There were no differences in smoking prevalence among high school students and adults enrolled in Medicaid with and without asthma. Fifteen percent of adults and 12.3% of children with asthma reported that someone smoked in their house in the last week.

Figure 14. Smoking prevalence and reported exposure to second hand smoke among people with asthma, Montana, BRFSS, 2010, YRBS, 2011, MMHCDS, 2012, ACBS, 2006-2010



I=95% confidence interval

The Montana Tobacco Quit Line (1-800-QUIT-NOW) offers free counseling and free or reduced-cost cessation medication to people who use tobacco. Between August 1, 2011 and February 21, 2012, 914 people who smoked and lived with someone with asthma called the Montana Tobacco Quit Line and nearly all (87.2%) chose to enroll in the program. About half (53.3%) of those who lived with someone with asthma also had asthma. The most frequently reported sources of referral to the Quit Line among people who smoked and lived with someone with asthma were television advertisements and a HCP. Quitting tobacco use can not only improve the health of the person who uses tobacco, but also will improve the air quality for the people around them, especially those with asthma.

Work-related asthma

The workplace can cause new onset of asthma and workplace exposures can trigger or aggravate existing asthma. Occupational asthma (OA) is attributable to a particular occupational environment and not to triggers encountered outside the workplace.[11] OA is further divided into two categories, with latency and without latency. OA without latency is an acute onset reaction and occurs infrequently. More frequently, OA has a latency period which may be days, weeks, or even years in duration. OA has become one of the most prevalent occupational lung diseases in developed countries.[12] Work-aggravated asthma is “preexisting or concurrent asthma that is exacerbated by workplace exposure.”[13] Work-related asthma refers to any asthma that is caused or aggravated by the work environment.

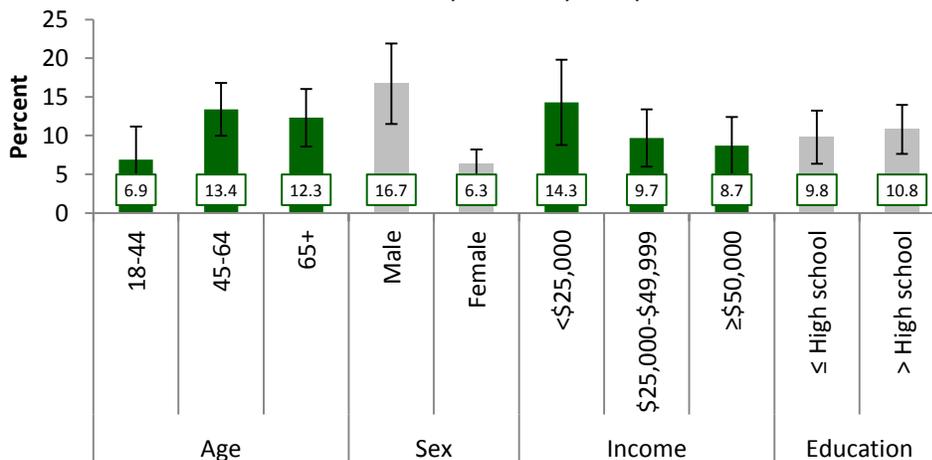
About half of Montanans with current asthma reported that their disease was somehow linked to a current or previous job (Table 4). Ten percent reported having to change jobs because it caused or exacerbated their asthma.

Table 4: Self-reported work-related asthma among people with current asthma, Montana, ACBS, 2006-2010

	Percent	95% Confidence Interval
Caused by current or previous job	42.2	38.0-46.5
Aggravated by current or previous job	34.1	30.0-38.1
Caused or aggravated by current job	20.3	16.5-24.1
Caused or aggravated by previous job	37.5	33.5-41.6
Quit or changed job because it caused or made asthma worse	10.4	7.7-13.2
Ever told by a health care provider that asthma is work related	10.4	8.0-12.8
Ever told a health care provider that asthma is work reported	11.8	9.2-14.3
Potentially linked to a current or previous job*	49.6	45.4-53.9
*‘Yes’ response to any of the 7 questions about work-related asthma		

Among people whose HCP had told them that their asthma was work-related, there were no significant differences by age, household income, or educational attainment. Men reported having work-related asthma more frequently than women (Figure 15).

Figure 15. Percent of adults with work-related* asthma by selected characteristics, Montana, ACBS, 2006-2010



I=95% confidence interval

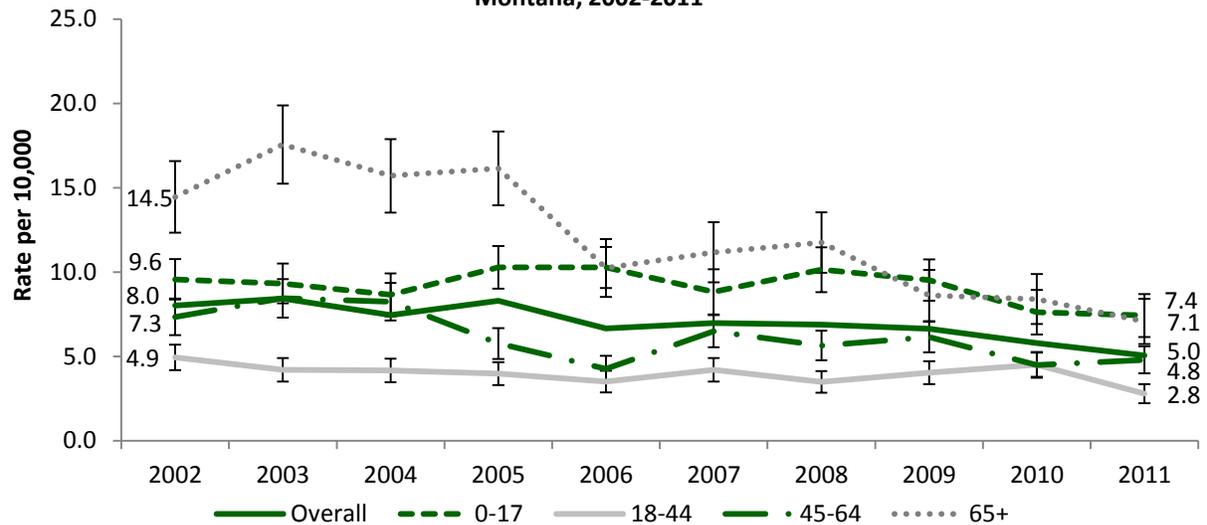
* Reported currently having asthma and that a HCP told them their asthma was related to any job they have

Asthma care

Hospitalization

When in control, asthma should be managed through regular outpatient care. However, asthma hospitalizations do occur. On average, there were 665 hospitalizations with a primary diagnosis of asthma per year in Montana between 2002 and 2011 (MHDD). The asthma hospitalization rate was significantly lower in 2011 than in 2002 in Montana (Figure 16). Children between birth and age 17 years and adults over the age of 65 years had significantly higher rates of asthma hospitalization than other age groups in 2011.

Figure 16. Asthma hospitalization rate per 10,000 people by age group, MHDD, Montana, 2002-2011



I=95% confidence interval

Characteristics of an asthma hospitalization

- Asthma hospitalizations lasted an average of three days between 2002-2011
- 47% of asthma hospitalization in 2011 were paid for by Medicaid, Medicare, or some other governmental source
- The average charge for an asthma hospitalization was \$9,300 in 2011
- The number of hospitalizations due to asthma has decreased between 2008 and 2011 (666 to 504), but the average charge per hospitalization has increased (\$7,500 to \$9,300)
- Asthma hospitalization charges totaled approximately \$4.7 million in 2011
- Asthma is listed as a secondary diagnosis for approximately 4,200 additional hospitalizations each year, on average
- Pneumonia was the most common primary diagnosis associated with asthma as a secondary diagnosis

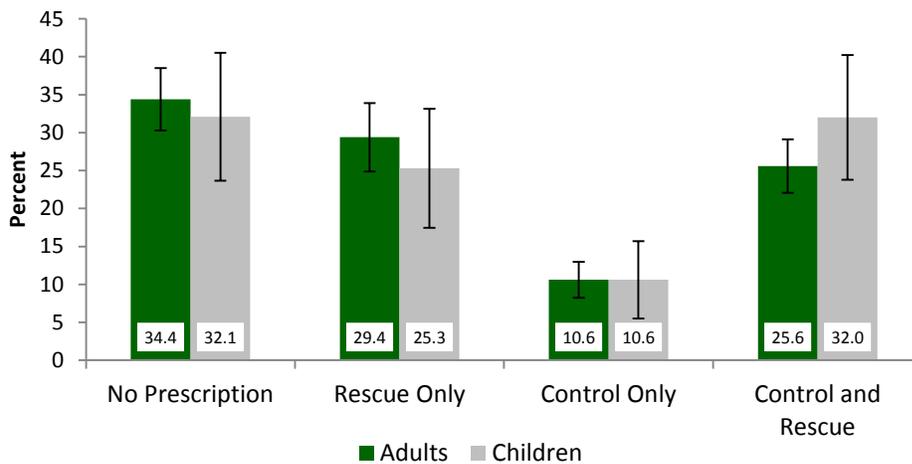
Medication use

A variety of medications are used to reduce and control asthma symptoms. For people with persistent asthma symptoms, two classes of medications are required for proper treatment: rescue and controller medications. All people with asthma should have a rescue medication. Those with persistent asthma

symptoms should have both rescue and controller medications.[9] Among adults and children in Montana with current asthma, only 55.0% and 57.3%, respectively, reported having a rescue medication (Figure 17). Thirty-six percent of adults and 42.6% of children with current asthma reported using a controller medication. Approximately one-third of adults and children with current asthma reported not having any prescription medication to treat their asthma.

For all ages, the most common controller medications reported were inhaled corticosteroids (76.5%), followed by long-acting beta agonists (59.5%), and leukotriene modifiers (38.5%). The most common rescue medication was an inhaled SABA (93.9%) (data not shown).

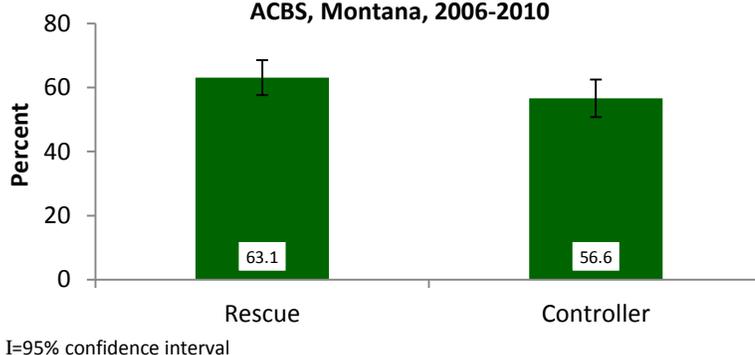
Figure 17. Percent of adults and children with current asthma by type of asthma medication used, ACBS, Montana, 2006-2010



I=95% confidence interval

Proper use of medication is important for establishing and maintaining asthma control. For controller medications, proper use means taking it on a daily basis, but not taking it during an attack or before exercising. For rescue medication, proper use means taking it during an attack and not taking it on a daily schedule. Approximately 60% of adults and children reported proper use of their inhaled controller and rescue medications (Figure 18). Without the ability to self-manage asthma symptoms with proper medication use, an exacerbation may lead to an unnecessary emergency department visit or hospital admission.

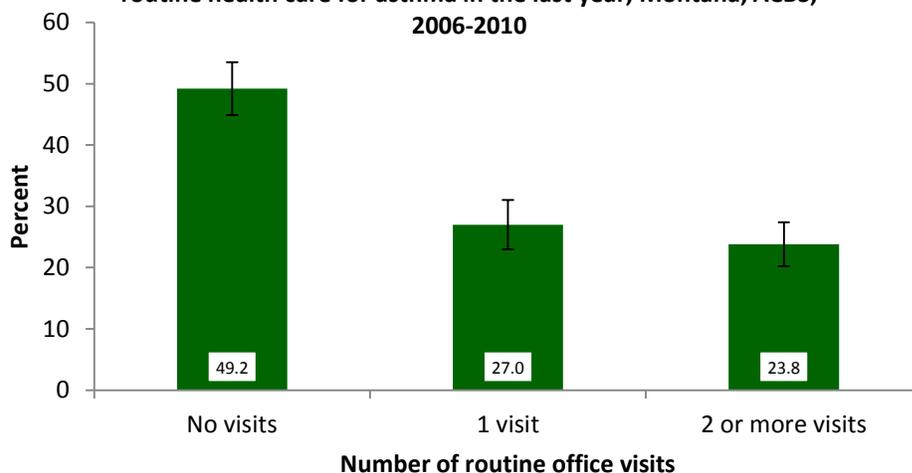
Figure 18. Percent of adults and children with current asthma who used their asthma medications properly, ACBS, Montana, 2006-2010



Frequency of health care visits and access to care

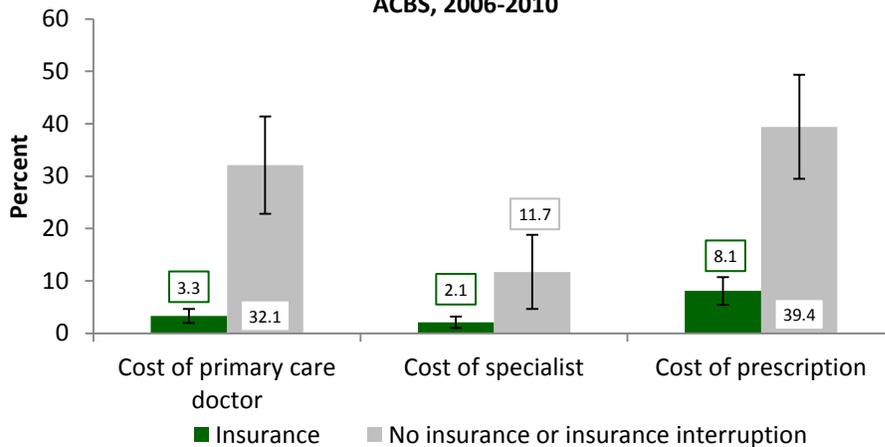
The EPR-3 Guidelines recommend having two routine medical visits for asthma a year. Only a quarter of adults with current asthma reported having seen a health care provider at least twice in the last year for their asthma (Figure 19).

Figure 19. Percent of adults with current asthma who sought routine health care for asthma in the last year, Montana, ACBS, 2006-2010



Access to health care is an important consideration in managing a chronic disease like asthma and having health insurance is key to making health care accessible. Adults with current asthma who had no insurance or who experienced an insurance interruption in the last year had a higher frequency of being unable to afford the cost of seeing a health care professional, see an asthma specialist, or to fill an asthma prescription than those with continuous insurance (Figure 20).

Figure 20. Percent of adults with current asthma who could not afford some aspect of asthma care by insurance status, Montana, ACBS, 2006-2010

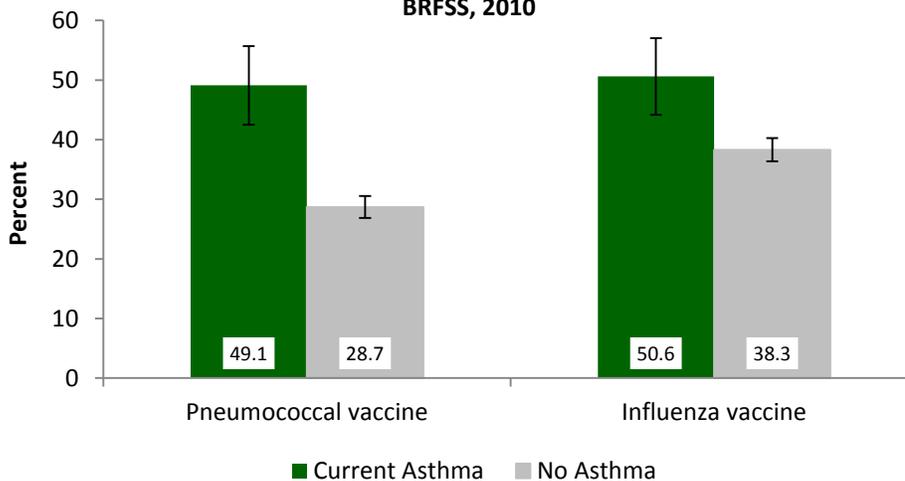


I=95% confidence interval

Vaccinations

People with asthma are at higher risk for severe influenza and pneumonia symptoms than are people without asthma. All children and adults with asthma should receive an annual influenza vaccine and all adults with asthma should receive the pneumococcal vaccine. A significantly higher percent of adults with current asthma in Montana received an annual influenza vaccine and a have received a pneumococcal vaccine sometime in their lifetime than have people without asthma (Figure 21). However, only half of adults with current asthma report having received these vaccines.

Figure 21. Vaccination status of adults by asthma status, Montana, BRFSS, 2010



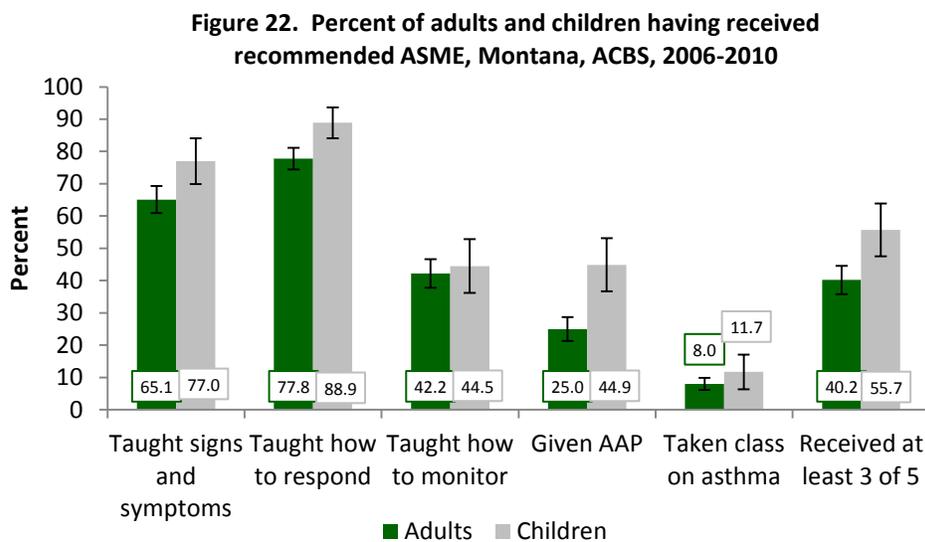
I=95% confidence interval

Asthma self-management education

The EPR-3 Guidelines identify asthma self-management education (ASME) as an essential tool for people with asthma to control and improve their asthma symptoms. The guidelines recommend that ASME be integrated into all aspects of care and that it be repeated and reinforced. There are five major

components to asthma education: 1) ever taught to recognize early signs and symptoms of an asthma attack; 2) ever taught what to do during an asthma attack; 3) ever taught how to use a peak flow meter; 4) ever given an asthma action plan (AAP); 5) ever taken a course on how to manage asthma. Only 40% of adults and 56% of children report having received at least 3 of the 5 recommended pieces of ASME (Figure 22).

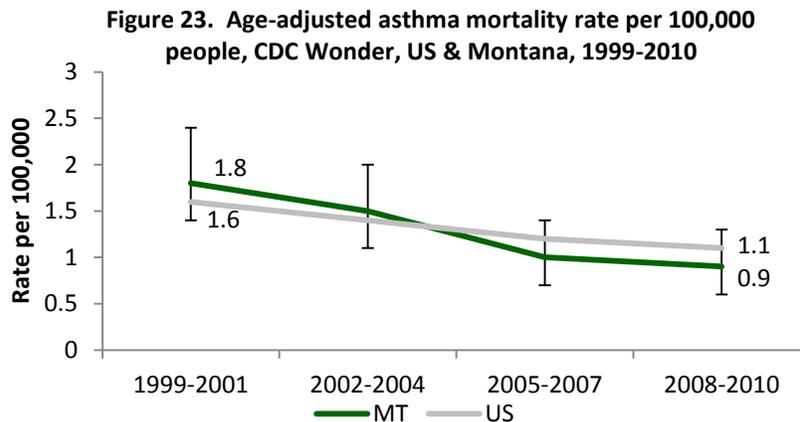
Everyone with current asthma should have an asthma action plan. The plan describes daily treatment, how to control asthma, and how to handle worsening symptoms, including when to call the doctor or go to the emergency room. Only one quarter of adults and 45% of children with current asthma report having ever received an asthma action plan in Montana (Figure 22).



I=95% confidence interval

Mortality

Asthma deaths are rare. Between 1999 and 2010, an average of 13 people died each year in Montana from asthma. The mortality rate has been declining over the last decade (Figure 23).



I=95% confidence interval

Years of potential life lost (YPLL) is an estimate of premature mortality. It is computed as the difference between a person’s age at death and age 75 for individuals who die before age 75. From 2002 to 2011, the average number of YPLL for Montanans who died of asthma was 10 years (Table 5).

Table 5: Average years of life lost by cause of death, Montana, OVS, 2002-2011

Cause of death	Avg. # of years
Homicide	39.6
Suicide	29.6
Asthma	9.8
Malignant Neoplasm	6.9
Diabetes	6.6
Heart Disease	4.6
Pneumonia and Influenza	3.4
Other Chronic Lower Respiratory Diseases (CLRD)	3.0
Cerebrovascular Disease	2.6

Asthma and schools

Since asthma is one of the most common chronic diseases among children, proper management and control is necessary in the school setting. Furthermore, asthma is one of the leading causes of missed school days due to illness.[14] Children with asthma missed 10.5 million days of school in the US in 2008.[15] About 40% (95% CI 31%-49%) of students in Montana with current asthma reported missing at least one day of school in the last 12 months because of their asthma (ACBS, 2006-2010).

Ideally, schools should have professional school nurses to perform health-related tasks, but school nurses are often in short supply and may spread their time among multiple schools; one nurse may be responsible for thousands of students. National standards recommend one school nurse for every 750 students. In Montana, the nurse-to-student ratio is 1:1,451.[16] Having school nurses available to help manage students’ asthma can ensure that students with asthma receive daily medications and monitor their disease, which is more likely to keep them in school rather than send them home if symptoms worsen. Only 12% of schools in Montana have full-time registered nurses to provide health services in school (Table 6). The national median is 44%.

School policies can assist students with asthma and ensure that staff are trained to handle asthma in schools. The School Health Profiles “is a system of surveys assessing school health policy and practices in states, large urban school districts, territories, and tribal governments.”[17] These surveys are conducted every two years to monitor the status of a variety of health management and education activities. In 2007, Montana passed a law to allow students to carry their own asthma medication. Results from the 2010 School Health Profiles for Montana report that only 42.9% of secondary schools report having policies to permit students to carry and administer their own medication (Table 6). Also, having individualized asthma action plans and providing staff training can assist in providing the best care to students with asthma. However, fewer than half of secondary schools report having asthma

action plans on file for students with asthma and only 13.7% report that staff receive annual training on responding to asthma symptoms.

Table 6: School health profiles [17], Secondary schools, CDC, Montana, 2010

	US median (range)	Montana
Schools with a full-time registered nurse that provides health services to students at school.	43.9 (4.9 – 99.4)	11.9
Schools that implemented a policy permitting students to carry and self-administer asthma medications by communicating the policy to students, parents, and families, and by designating an individual responsible for implementing the policy	52.5 (21.9 – 69.6)	42.9
Schools that had an asthma action plan on file for all students with known asthma	58.5 (31.0 – 87.6)	40.9
Schools that identified students with poorly-controlled asthma by keeping track of them in at least three different ways	63.9 (40.7 – 75.9)	54.9
Schools that provided intensive case management for students with poorly-controlled asthma at school	25.7 (9.8 – 50.6)	13.7
Schools that required all school staff members to receive annual training on recognizing and responding to severe asthma symptoms	30.8 (11.6 – 65.8)	13.7
Schools that provided parents and families with health information to increase parent and family knowledge of asthma	20.0 (6.6 – 37.3)	17.7

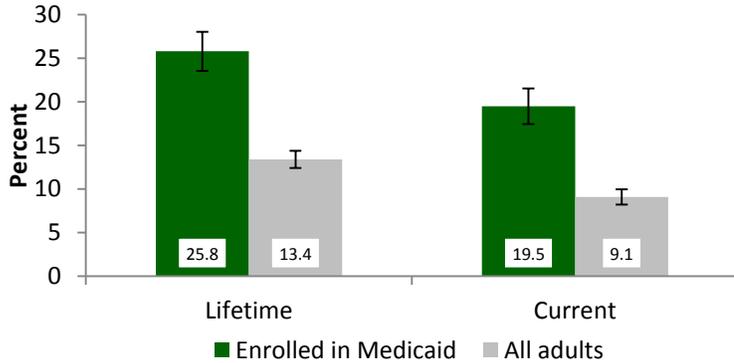
Other populations

Medicaid enrollees

People who live in poverty have a higher prevalence of asthma than do people who do not live in poverty.[15] Furthermore, people with asthma who report lower incomes are less likely to have well-controlled asthma and are also more likely to use an ED for crisis oriented care.[18, 19] Lack of regular outpatient care and poorly-controlled asthma may lead to activity limitation, missed work days, and increased medical costs, which add hardships for people already on limited incomes. Montana Medicaid provides health care coverage to qualifying low income adults and children. Adults are eligible for Medicaid if they meet specific financial requirements and are parents, are pregnant, have breast or cervical cancer, are age 65 years or older, or are blind or disabled. Adults enrolled in Medicaid were unable to be excluded from the adult estimates in this analysis. Therefore, the all adult percentages may be overestimated.

About one in four adults enrolled in Medicaid have received a diagnosis of asthma (Figure 24). Furthermore, adults enrolled in Medicaid had a significantly higher prevalence of asthma than the entire population.

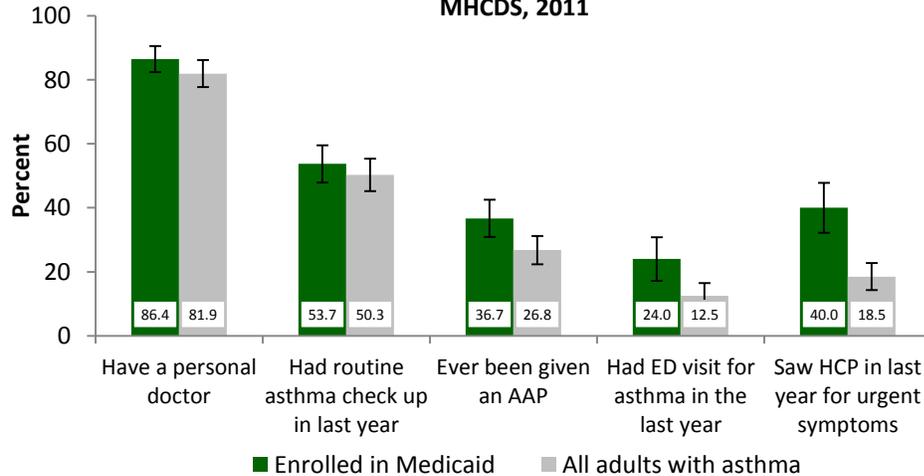
Figure 24. Prevalence of lifetime and current asthma among adults aged 18-64 years, Montana, BRFSS, 2010, MMHCDS, 2011



I=95% confidence interval

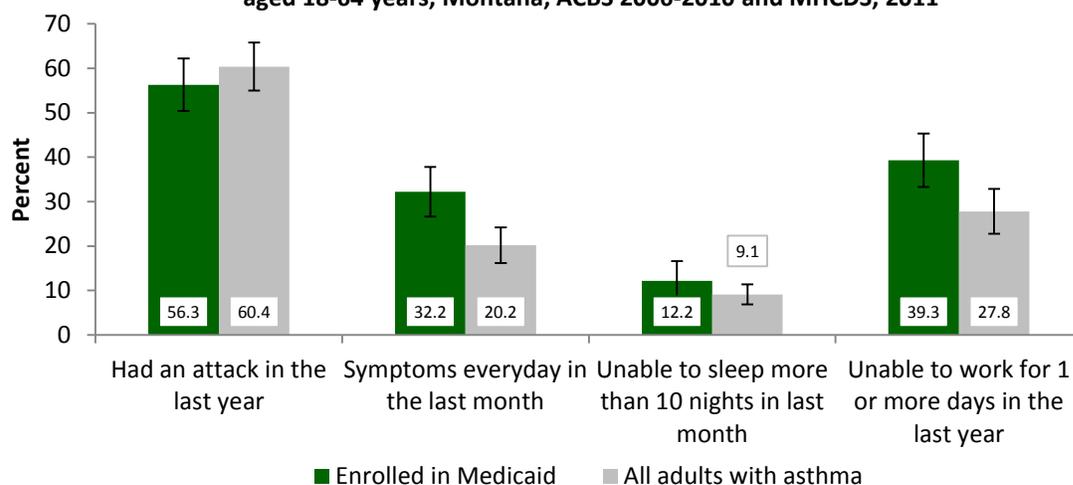
Adults enrolled in Medicaid experienced more constant asthma symptoms and more urgent health care needs despite reporting having received preventive services, like having a routine check-up and having an AAP, more frequently than the entire adult population (Figures 25, 26).

Figure 25. Self-reported health care utilization among adults aged 18-64 years with current asthma, Montana, ACBS 2006-2010 and MHCDS, 2011



I=95% confidence interval

Figure 26. Self-reported asthma symptoms among adults with current asthma aged 18-64 years, Montana, ACBS 2006-2010 and MHCDS, 2011



I=95% confidence interval

In 2011, there were over 5,100 adults and children enrolled in Medicaid who had at least one claim with a primary diagnosis of asthma. For those people, there were nearly 38,200 claims for asthma including inpatient, emergency, outpatient, and pharmacy visits. Two thirds (67.5%) of people enrolled in Medicaid with an asthma claim had at least one claim for an asthma prescription, although prescriptions for children were filled more often than prescriptions for adults (80.4% vs. 48.2%) (Medicaid Administrative Claims Data, 2011).

American Indians

American Indians are the largest minority population in Montana. As a group, they more frequently have lower household incomes, higher prevalence of being overweight or obese, have lower educational attainment, and self-reported poorer health status than do White residents (BRFSS, 2007-2010). Some of these factors may place American Indians at higher risk for asthma. However, controlling for these factors, American Indian race alone was not independently associated with increased asthma prevalence (Table 1).

Among American Indians there were no differences in asthma prevalence by age group, sex, BMI category, income group, or educational attainment (Figures 27, 28). American Indians who self-reported fair or poor health had higher prevalence of asthma than those who reported good, very good, or excellent health. Some subgroups of American Indians experienced a higher prevalence of asthma than did Whites: females, those aged 45 to 64 years old and those with more than a high school education.

Figure 27. Prevalence of current asthma among American Indian and White adults by age, sex, and BMI, Montana, BRFSS, 2007-2010

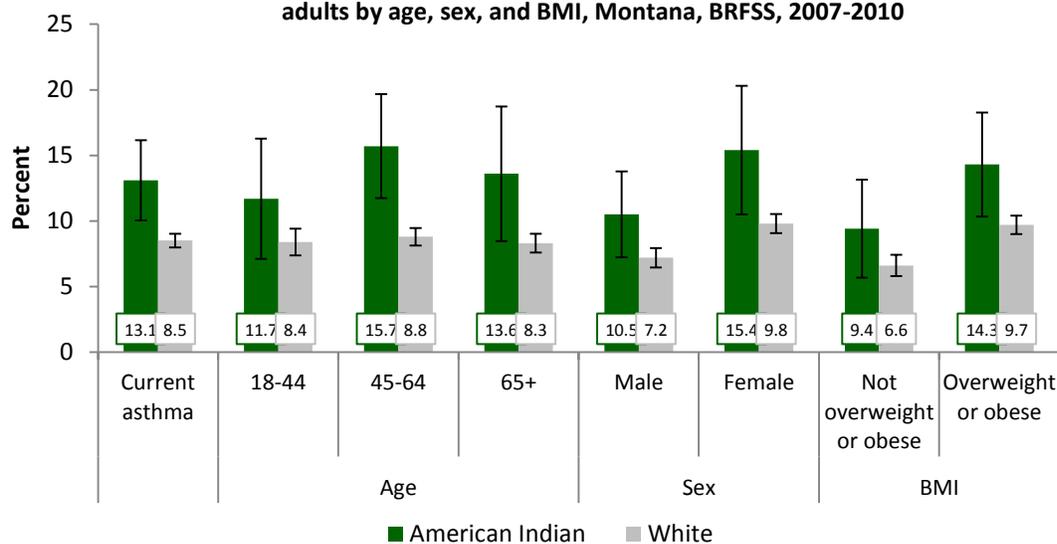
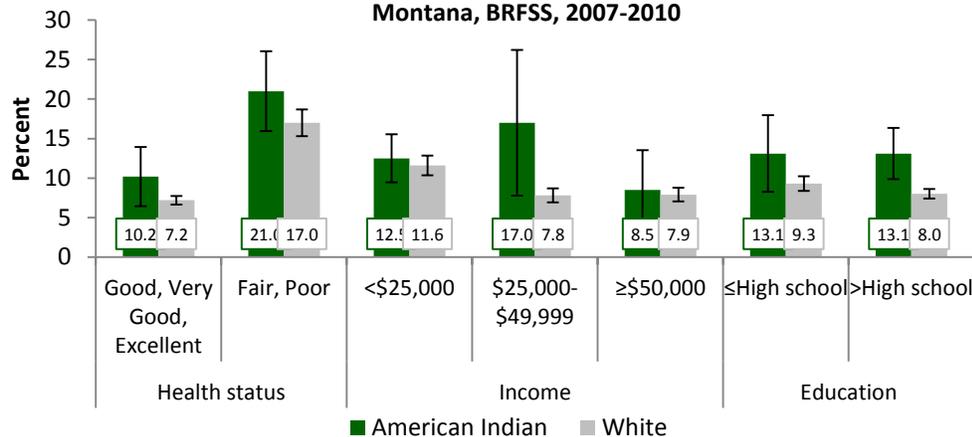


Figure 28. Prevalence of current asthma by American Indians and White adults by health status, income, and educational attainment, Montana, BRFSS, 2007-2010



Healthy people 2020 goals and objectives

HP 2020 goals provide a 10-year national agenda designed to improve the population’s health status. Each goal has a series of specific objectives, baseline measures describing the nation’s health status at the beginning of the decade, and targets to be reached by 2020. Montana has met the HP 2020 targets for asthma hospitalizations and for providing education to people with asthma on how to respond to an attack (Table 7). No other measurable targets have been met.

Table 7: Healthy People 2020 goals for asthma, MOVS, 2002-2011, MHDD, 2002-2011 ACBS, 2006-2010

Objective	Target %	Baseline % (US)	Montana %
Reduce the rate of asthma deaths			
Children and adults under age 35 (per million)	**	3.4	*
Adults aged 35 to 64 (per million)	6.0	11.0	8.0 (5.4-11.3) [§]
Adults aged 65 and older (per million)	22.9	43.3	58.2 (46.0-72.5) [§]
Reduce the rate of asthma hospitalizations			
Children under age 5 (per 10,000)	18.1	41.4	18.0 (17.0-19.0) [§]
Children and adults aged 5 to 64 (per 10,000)	8.6	11.1	5.0 (4.9-5.2) [§]
Adults aged 65 and older (per 10,000)	20.3	25.3	11.9 (11.3-12.5) [§]
Reduce the rate of asthma emergency department visits			
Children under age 5 (per 10,000)	95.5	132.7	***
Children and adults aged 5 to 64 (per 10,000)	49.1	56.4	***
Adults aged 65 and older (per 10,000)	13.2	21.0	***
Reduce proportion of people with current asthma who experience activity limitations due to asthma			
Persons with current asthma who experience activity limitations due to chronic lung and breathing problems	10.2%	12.7%	***
Children aged 5 to 17 years with asthma who miss school days	48.7%	58.7%	*
Adults aged 18 to 64 with asthma who miss work days	26.8%	33.2%	41.1% (35.1%-47.1%) [§]
Increase proportion of persons who received formal asthma education			
Persons with current asthma who receive formal patient education	14.4%	12.1%	7.7% (4.2%-11.1%) [§]
Increase the proportion of persons with current asthma who receive appropriate asthma care according to National Asthma Education and Prevention Program guidelines			

Persons with current asthma who receive written asthma management plans from their health care provider	36.8%	33.4%	24.8% (18.7%-30.8%) [§]
Persons with current asthma with prescribed inhalers who receive instruction on their use	**	95.9%	96.1% (93.3%-98.8%) [§]
Persons with current asthma who receive education about appropriate response to an asthma episode, including recognizing early signs and symptoms or monitoring peak flow results	68.5%	64.8%	75.5% (68.9%-82.1%) [§]
Persons with current asthma who do not use more than one canister of SABA per month	90.2%	87.9%	***
Persons with current asthma who have been advised by a health care professional to change things in their home, school, and work environment to reduce exposure to irritants or allergens to which they are sensitive	54.5%	50.8%	26.9% (20.7%-33.1%) [§]
*Too few events to calculate a reliable rate.			
** Being tracked for informational purposes. If warranted, a target will be set during the decade			
*** Data not available for calculation			
§ 95% Confidence Interval			

Conclusions

In conclusion, asthma affected an estimated 84,000 Montana residents in 2010 and its distribution varies among sociodemographic groups, with the largest disparities occurring across income and race. Asthma leads to significant cost, personal limitations, and occasionally death, but it can be controlled with regular outpatient care, self-management, and medication. This report highlights the need for continued efforts in Montana to educate people with asthma on how to control their disease; train and support providers about evidence-based asthma care; and inform and support schools, daycares, and workplaces about ways to prevent severe asthma outcomes among their students and employees. The MACP is committed to improving the quality of life for all Montanans with asthma.

Glossary

Age adjustment is a technique used to compare the rates of disease in groups that have different age structures. Each population's disease rate is presented as if it occurred in a population of a standard age structure. Age-adjusted rates can be compared directly from population to population.

Confidence Interval is an expression of the precision of an estimated rate or prevalence. For a 95% confidence interval, we expect the true value of the rate or prevalence to fall within the interval with 95% certainty. If the confidence intervals for two rates or prevalences do not overlap, the difference is considered statistically significant.

International Classification of Disease (ICD) is the standard classification system used to classify diseases and other health problems recorded on many types of health and vital records. At the time this report was written, ICD-9 is used for health conditions in living patients and ICD-10 is used for causes of death.

Multiple Logistic Regression is a statistical method for identifying how multiple independent variables uniquely predict a dependent variable. Results are expressed as an odds ratio: the probability of disease given an exposure to a specific factor in one group compared to another group.

Prevalence is the number of existing cases of a disease in a specified population at a specified point in time; it is usually presented as the number of cases per 100,000 population. Prevalence is also used to describe the proportion of people who have various characteristics or engage in various behaviors; in this case, it is usually expressed as a percent.

Rate is the number of people with a disease divided by the total population at risk. A rate is usually expressed relative to a standardized denominator. For most disease incidence and mortality rates, the denominator is 100,000 people.

Underlying Cause of Death is the disease or event that set in motion the process that led to death.

Years of Potential Life Lost is a measure of the relative impact of various disease and other lethal forces in a population. It is used to bring attention to the loss of expected years of life due to an early death. For this analysis, a person was considered to have experienced an early death if they died before their 75th birthday.

Technical notes, data sources, and questions from survey

Survey questions used as definitions

Below is a list of the combinations of validated survey questions that were used to define health conditions and whether a person received health care services.

BRFSS Survey Questions		
Definition	Survey question(s)	Response
Ever diagnosed with asthma (Lifetime asthma)	“Has a doctor or nurse ever told you that you had asthma?”	Yes
Have current asthma	“Has a doctor or nurse ever told you that you had asthma?” AND “Do you still have asthma?”	Yes AND Yes
Dissatisfied with life	“In general, how satisfied are you with your life?”	Dissatisfied OR Very dissatisfied
Mental health not good ≥7 days in last month	“Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?”	7-30 days
Fair/poor self-reported health status	“Would you say that in general your health is:”	Fair OR Poor
Current smoker	“Have you smoked at least 100 cigarettes in your entire life?” AND “Do you now smoke cigarettes every day, some days, or not at all?”	Yes AND Everyday OR Some days
Current influenza flu vaccine	“A flu shot is an influenza vaccine injected into your arm. During the past 12 months, have you had a seasonal flu shot?” OR	Yes OR Yes

BRFSS Survey Questions		
	“The seasonal flu vaccine sprayed in the nose is also called FluMist™. During the past 12 months, have you had a seasonal flu vaccine that was sprayed in your nose?”	
Ever have a pneumonia vaccine	“A pneumonia shot or pneumococcal vaccine is usually given only once or twice in a person’s lifetime and is different from the flu shot. Have you ever had a pneumonia shot?”	Yes

Data sources

Mortality data

Data on mortality are collected from death certificates reported to the Office of Vital Statistics. Data on deceased persons for whom an asthma-related ICD-10 code was listed as the underlying cause of death on the death certificate during the years 2000-2011 were included in this analysis. [The ICD-10 codes can be found online at the World Health Organization’s webpage.](#)

Hospitalization data

The Montana Hospital Discharge Data System (MHDDS) contains inpatient hospitalization data provided by the Montana Hospital Association and is based on the 2004 Uniform Billing form. Data from hospitalizations occurring in 2000-2011 are presented in this document. Only persons hospitalized in Montana whose primary or secondary diagnosis was asthma were included. No race information was available from the MHDDS. Reporting hospital admissions to the Montana Hospital Association is not mandatory and discharges from Veterans Administration, Indian Health Service, and a few small Critical Access Hospitals are not included. The MHDDS does not contain patient identifiers and may include multiple instances of the same patient being admitted for the same asthma-related event.

State-wide surveys

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based, random-digit dialed telephone survey of a sample of non-institutionalized adults conducted in all 50 states. This survey consists of questions about personal risks, behaviors, and lifestyle choices, including several questions related to asthma. There are limitations to this dataset including misinterpretation of questions or inability to recall an event. The survey does not capture people in homes without a telephone or people who are institutionalized. [Learn more about the BRFSS at the Centers for Disease Control and Prevention \(CDC\) website.](#)

The Asthma Call Back Survey (ACBS) is a follow-up survey of adults and children who responded in the BRFSS that they had lifetime or current asthma. During the BRFSS, adults are asked if they would be willing to participate in the follow-up survey or if they would be willing to respond as a proxy for a child in their household. For those who agree, a follow-up call is made by appointment about two weeks later. Respondents are asked a series of questions about their asthma symptoms, education they have received, alternative treatments, medications they currently take, environmental exposures, and work-related asthma. These responses are combined with their BRFSS responses for analysis.

The Youth Risk Behavior Survey (YRBS) is administered every two years in a sample of high schools around the United States. Questions on the survey ask for information on health risk behaviors including tobacco, alcohol and drug use, dietary and physical activity, sexual activity, and injury and violence. The data are weighted to represent the state. The limitations of this dataset include misinterpretation of questions or inability to recall an event. [For more information about the YRBS, see the CDC website.](#)

The Montana Medicaid Health and Chronic Disease Survey (MMHCDS) is a survey administered to a random selection of adults aged 18-64 years enrolled in Medicaid. The survey is based on the BRFSS and asks questions about health risks and behaviors. This is a representative sample of low-income adults who are parents, disabled, or pregnant.

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