Asthma in Maryland 2012

Maryland Department of Health and Mental Hygiene

Family Health Administration

Maryland Asthma Control Program

MARYLAND ASTHMA SURVEILLANCE REPORT

2012

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HIGHLIGHTS

- Statewide, in 2010, approximately 535,500 (12.4%) Maryland adults and 216,000 (16.4%) children had a history of asthma. Of those, approximately 359,000 (8.4%) adults and 155,500 (11.9%) children currently had asthma.

- In 2010, approximately 33.9% of asthmatic children enrolled in Medicaid and MCHP had persistent asthma.

- In 2010, there were 37,523 asthma-related emergency department visits (65.5 per 10,000 residents) and 10,143 asthma hospitalizations* (17.6 per 10,000 residents).

- In 2010, there were 72 deaths (12.6 deaths per million) due to asthma as an underlying cause and 206 (36.2 deaths per million) deaths due to asthma as an underlying or contributing cause.

- Combining 2008 and 2010 data, 27.3% of adults and 32.3% of children with asthma reported difficulty sleeping at least 3 or more nights during the past month due to asthma symptoms.

- For adults and children who suffer from asthma, 10% of adults and 3% of children reported experiencing asthma symptoms every day during the past 30 days (2008-2010 combined data).

- Combining 2008 and 2010 data, almost a quarter of school-aged children with asthma missed three or more school days during the past 12 months due to asthma symptoms (24.6%).

- Combining 2008 and 2010 data, three in ten adults with asthma were unable to work for at least one day during the past 12 months due to asthma (29.9%).

- Combining 2008 and 2010 data, 6.9% of adults with asthma reported having been told by a health professional that their asthma was work-related.

- Many disparities exist in asthma morbidity and mortality. Persons at increased risk for asthma and its complications include the very young, the elderly, Black racial demographic, women, individuals with low-income and lower levels of education, and individuals in certain jurisdictions, particularly Baltimore City.

- In 2010, charges for hospitalizations due to asthma totaled over $66 million. Charges for emergency department visits due to asthma totaled an additional $26 million.

- Compared to those without asthma, adults with asthma perceive their general health less favorably.

* Includes Maryland residents hospitalized in Delaware, Pennsylvania, and Washington D.C.

INTRODUCTION

Asthma is a controllable, chronic lung disease characterized by inflammation of the airways, reversible airway constriction, and excess mucus secretion. This narrowing of the airway results in reduced airflow that may cause symptoms of wheezing, coughing, tightness of the chest, and difficulty breathing. Asthma affects both adults and children and is the most common chronic disease of childhood and the 3rd leading cause of hospitalizations for children under 15 years old.[1, 2] In 2010, approximately 10.1 million (13.6%) U.S. children under 18 years of age had been diagnosed with asthma at some point in their lifetime, and an estimated 7.0 million (9.4%) children currently had asthma.[3] An estimated 29.1 million (12.7%) U.S. adults had been diagnosed with asthma during their lifetime, and an estimated 18.7 million (8.2%) adults currently had asthma in 2010.[4] In 2009, asthma was responsible for 479,000 hospitalizations nationwide.[5]

This is the ninth annual surveillance report of the Maryland Asthma Control Program (MACP). The MACP began in 2001, with funding from the Centers for Disease Control and Prevention (CDC) to develop a State Asthma Plan and an Asthma Surveillance Program.[6] In 2002, the Maryland State Legislature established the MACP in statute (General Article §§13-1701 through 13-1706, Annotated Code of Maryland). This mandate, in conjunction with the CDC funding, has allowed the Maryland Department of Health and Mental Hygiene (DHMH) and the MACP to provide leadership for reducing morbidity and mortality due to asthma in Maryland, particularly for its most vulnerable populations. Annual surveillance of asthma morbidity and mortality informs MACP's strategic direction for program planning, targeting of interventions, and coalition building.

Like previous surveillance reports, this report presents current data on asthma prevalence, mortality, and health care utilization, comparing state data to previous years, as well as to national data. This year's report includes an analysis of Medicaid data on medication usage and use of an asthma action plan, among other self-management practices of persons with asthma. In addition, the report includes information about the burden of asthma among Marylanders in school, child care, and workplace settings.

Data sources for this surveillance report include the following: CDC Behavioral Risk Factor Surveillance System (BRFSS), BRFSS Asthma Call Back Survey, Youth Tobacco Survey (YTS), Maryland Health Services Cost Review Commission's (HSCRC) hospital discharge dataset, Maryland Vital Statistics Administration dataset (VSA), and Maryland Medicaid/MCHP data.[7, 8, 9, 10, 11, 12, 13] For BRFSS data, asthma prevalence is identified by respondents' self-reports to a telephone survey. BRFSS Call-back Survey data combines years 2008-2010 to increase validity with a larger sample size. For HSCRC data, asthma is identified by the use of International Classification of Disease, 9th Edition (ICD-9) codes. Asthma includes all codes from 493.0 to 493.9. For mortality data, asthma was identified through ICD-9 codes until 1999. ICD-10 codes of J45 to J46 are used for 1999-2010 mortality data. Rates are based on 2010 population statistics from the U.S. Census Bureau.[14] Where possible, rates have been age-adjusted to the 2010 U.S. standard population in order to reliably compare populations with different age distributions.

PREVALENCE

As in previous years, asthma prevalence in Maryland was measured using the Behavioral Risk Factor Surveillance System (BRFSS), an ongoing statewide telephone survey of adults that is coordinated by the CDC and conducted in all 50 states, Washington D.C., and three U.S. territories. The survey is designed to monitor the prevalence of major behavioral risk factors associated with health risk behaviors, chronic disease, injuries, and preventable infectious disease among adults. Each year prior to 2005, approximately 4,400 Maryland residents were surveyed. Between 2005 and 2010, approximately 8,900 Maryland residents were surveyed each year. Results were weighted in order to adjust for the selection probabilities and estimated responses for the entire state population. Successive years of data were combined to permit the calculation of three-year averages and more stable estimates for subgroup comparisons. The 95% confidence interval (CIs) for these estimates are provided in Appendix A. Estimates are considered significantly different from each other when they do not have overlapping CIs.

The BRFSS survey includes questions about the respondents' lifetime and current asthma prevalence. Prevalence is the proportion of individuals who have asthma at a specific point in time. Lifetime prevalence is the proportion of individuals who have **ever** been diagnosed with asthma. Current prevalence refers to the proportion of individuals who **still have a diagnosis** of asthma at the time the question is asked. Since 2001, the lifetime prevalence question has been "Have you ever been told by a doctor, nurse, or health professional that you had asthma?" Current prevalence is assessed by the question "Do you still have asthma?" The current prevalence question has been asked since 2000.

The BRFSS has contained questions about pediatric asthma prevalence since 2001. Prior to 2003, only one question about lifetime asthma prevalence was included: "How many children under 18 years old in your household have ever been diagnosed with asthma?" Beginning in 2003, the survey began to include questions about both lifetime and current prevalence for children: "How many children under 18 years old in your household have ever been diagnosed with asthma?" and "how many of these children still have asthma?" In the 2005 through 2010 surveys, those two questions were modified. Lifetime and current questions are: "Has a doctor, nurse, or other health professional EVER said that the child has asthma?" and [If Yes] "Does the child still have asthma?"

Maryland has two additional data sources to estimate the prevalence of lifetime asthma among children. These additional data sources include the Youth Tobacco Survey (YTS) and Youth Risk Behavior Survey (YRBS). The Maryland YTS is a school-based survey that collects self reported information about the prevalence of current cigarette smoking, behaviors and attitudes toward smoking, and tobacco related health issues including asthma. The Maryland YTS is administered biennially since 2000 (except 2004 due to budgetary constraints) to students in grades 6 through 12. In 2006, the YTS added two questions to assess both lifetime and current prevalence of asthma.

PREVALENCE

The Maryland YTS consists of a total of 48 sampling frames from public schools – a middle school sampling frame (schools with any grades 6-8) and a high school sampling frame (schools with any grades 9-12) for each of the 24 jurisdictions. In 2010, a total of 29,199 students from 184 middle schools and 56,899 students from 169 high schools completed a usable questionnaire. This report provides 2010 weighted estimates of current asthma prevalence separately for middle and high school students. The 95% confidence interval (CI) for these estimates are provided. Estimates are considered significantly different from each other when they do not have overlapping CIs. Data from the YTS is presented at the end of the "**Prevalence of Asthma among Children Ages 0-17**" subsection. In interpreting data from the BRFSS and YTS on the prevalence of childhood asthma, readers should be aware that the definition of "lifetime asthma" and methods of data collection vary among these two data sources.

PREVALENCE - Adults

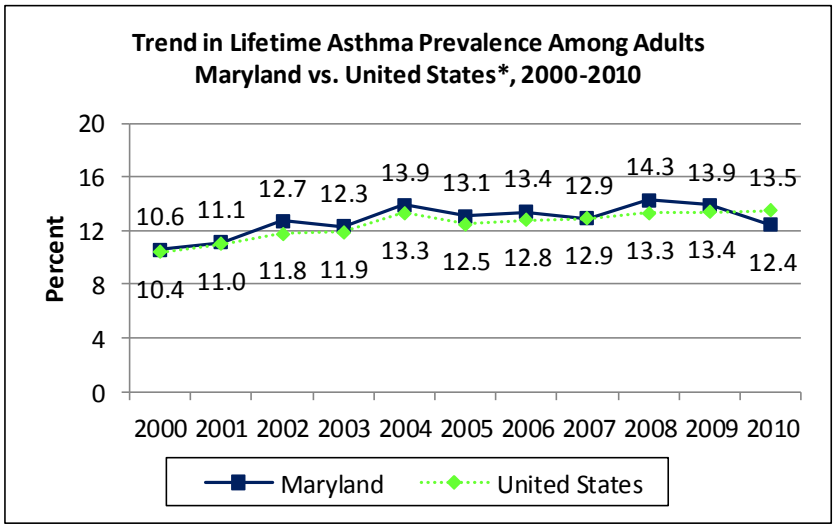
Prevalence of Asthma among Adults (ages 18+)

Lifetime asthma prevalence in Maryland adults showed an increase of approximately 17% from 2000 to 2010.

In 2010, the lifetime asthma prevalence in Maryland was an estimated 12.4%, approximately 535,500 adults (18 years and older).

The adult lifetime asthma prevalence in Maryland was significantly lower than the United States in 2010.[15]

Figure 1-1



Maryland BRFSS, 2000-2010; CDC BRFSS, 2000-2010.

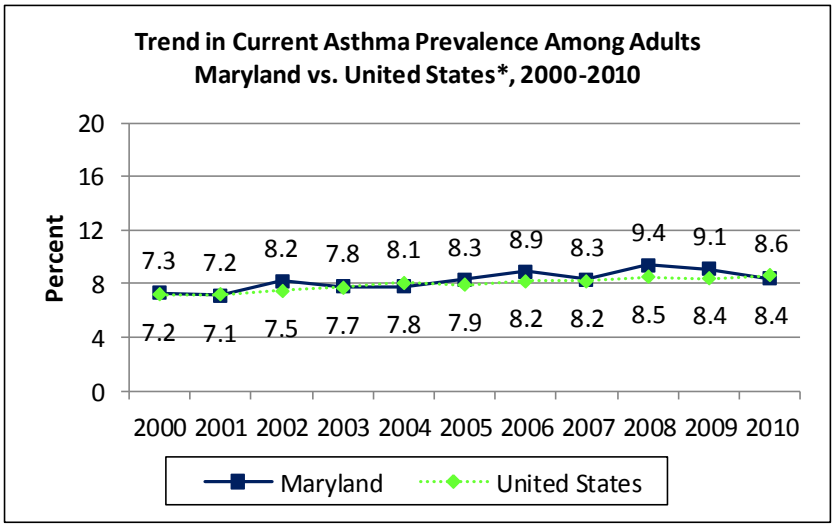
[a] U.S. includes 50 states plus Washington D.C. and excludes the three territories.

Current asthma prevalence in Maryland adults showed an increase of approximately 15% from 2000 to 2010.

In 2010, the current asthma prevalence was an estimated 8.4%, approximately 359,000 Maryland adults.

There's no statistically significant difference between the 2010 adult current asthma prevalence in Maryland vs. the United States.

Figure 1-2



Maryland BRFSS, 2000-2010; CDC BRFSS, 2000-2010.

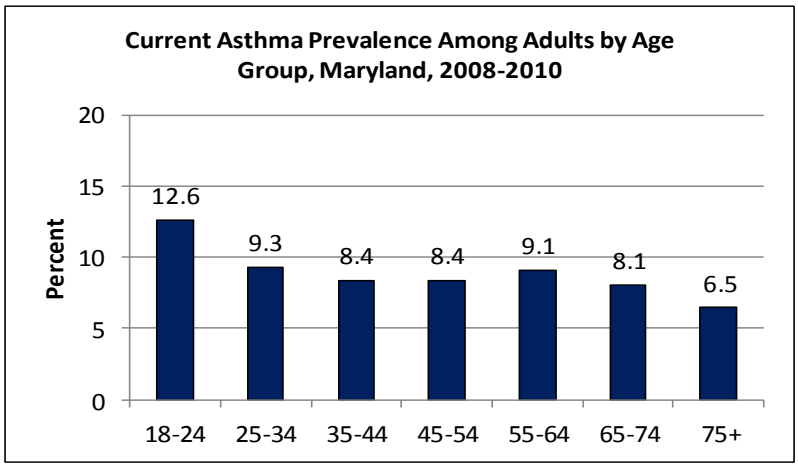
[a] U.S. includes 50 states plus the Washington D.C. and excludes the three territories.

PREVALENCE - Adults

Averaging 2008 and 2010 data, the current asthma prevalence was highest among adults aged 18 to 24 years old (12.6%) and lowest among adults aged 75 years and older (6.5%).

The difference between these two age groups was found to be statistically significant.

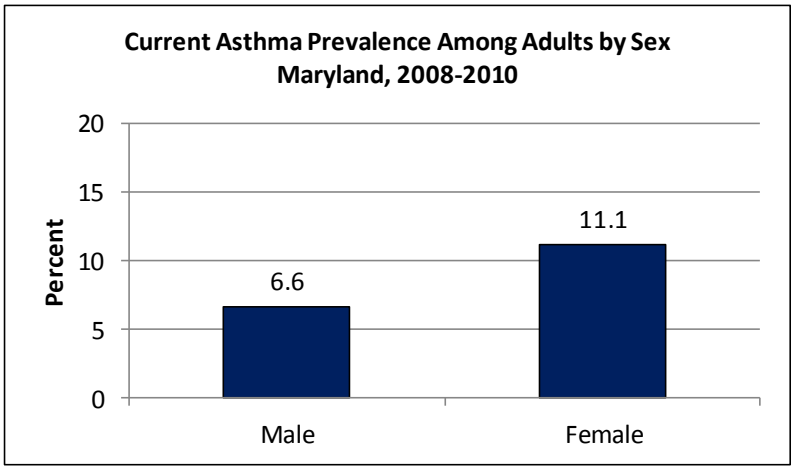
Figure 1-3



Maryland BRFSS, 2008-2010.

Averaging 2008 and 2010 data, the current asthma prevalence among females (11.1%) was significantly higher than the prevalence among males (6.6%).

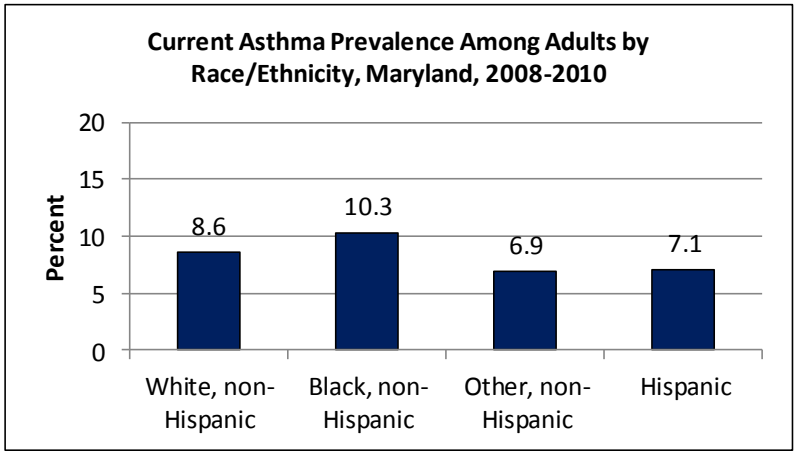
Figure 1-4



Maryland BRFSS, 2008-2010.

Averaging 2008 and 2010 data, the current asthma prevalence was significantly higher for adults who self-reported their race/ethnicity as Black, non-Hispanic (10.3%) compared to White, non-Hispanic and Other, non-Hispanic race/ethnicity categories (8.6%, 6.9%).

Figure 1-5



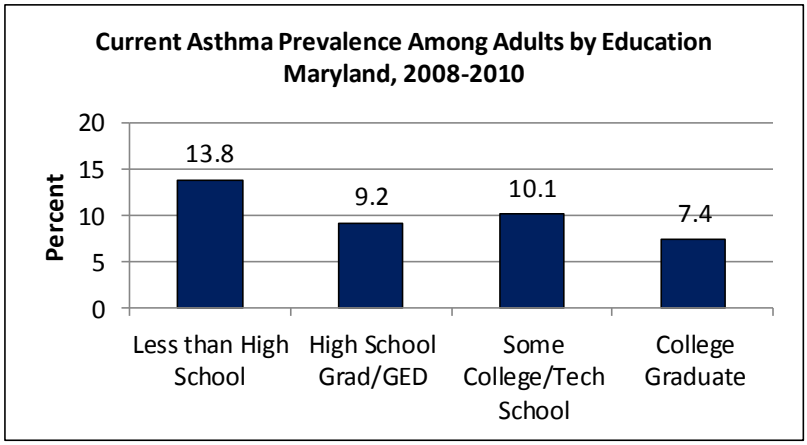
Maryland BRFSS, 2008-2010.

PREVALENCE - Adults

Averaging 2008 and 2010 data, adults that completed a college education had a significantly lower prevalence of asthma (7.4%) compared to those with less education.

The lowest level of education, 'Less than High School' had a significantly higher prevalence of asthma compared to those with more education.

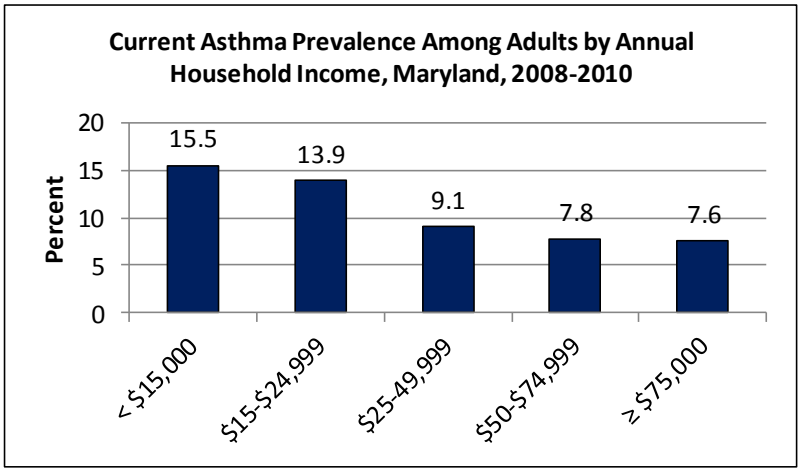
Figure 1-6



Maryland BRFSS, 2008-2010.

Averaging 2008-2010 data, adults reporting an annual household income in the lowest categories (less than $15,000 and $15-$24,999) had a significantly higher current asthma prevalence (15.5% and 13.9%) compared to adults reporting higher annual household incomes.

Figure 1-7

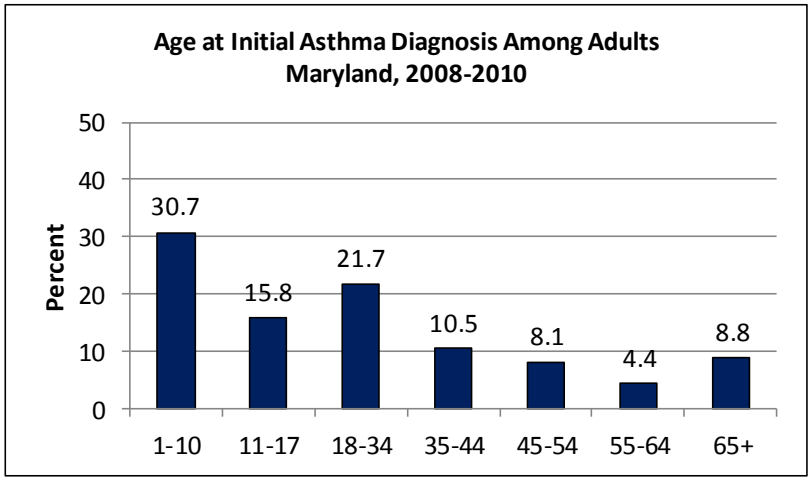


Maryland BRFSS, 2008-2010.

Averaging 2008 and 2010 data, 30.7% of adults with asthma were diagnosed as children between the ages of 1 to 10 years old.

The youngest age group (30.7%) was found to be significantly higher than the other age groups while the 55-64 year old age group (4.4%) was significantly lower than the other age groups.

Figure 1-8



Maryland BRFSS Call-back Survey, 2008-2010.

PREVALENCE - Children

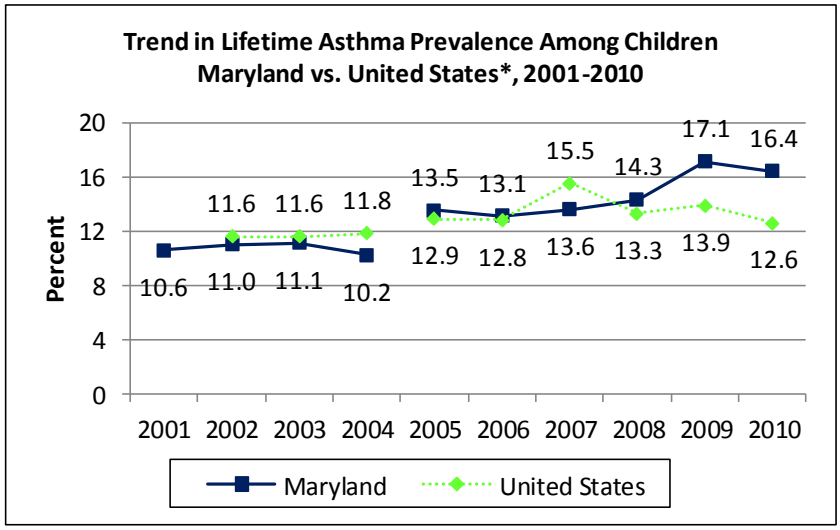
Prevalence of Asthma among Children Ages 0-17

Lifetime asthma prevalence in Maryland children showed an increase of approximately 54.7% from 2001 to 2010.

Among Maryland children less than 18 years of age, the lifetime asthma prevalence was 16.4% in 2010 - approximately 216,000 children.

The child lifetime asthma prevalence is significantly higher in Maryland vs. the United States (16.4% vs. 12.6%).

Figure 1-9



Maryland BRFSS, 2001-2010; CDC BRFSS, 2002-2010.

[a] Survey question for lifetime asthma prevalence changed in 2005, data from 2001-2004 are not comparable to 2005-2010 data.

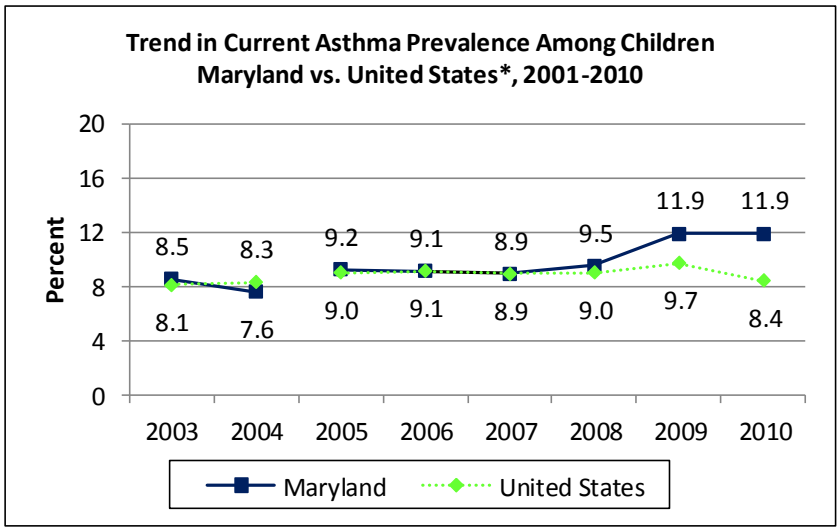
[b] BRFSS data for children is not collected in all states, each year the number of states collecting data on child asthma prevalence has been between 22 and 37 states.

Lifetime asthma prevalence in Maryland children showed an increase of approximately 40% from 2003 to 2010.

Among Maryland children less than 18 years of age, the current asthma prevalence was 11.9% in 2010 - approximately 155,500 children.

The child current asthma prevalence is significantly higher in Maryland vs. the United States (11.9% vs. 8.4%).

Figure 1-10



Maryland BRFSS, 2001-2010; CDC BRFSS, 2003-2010.

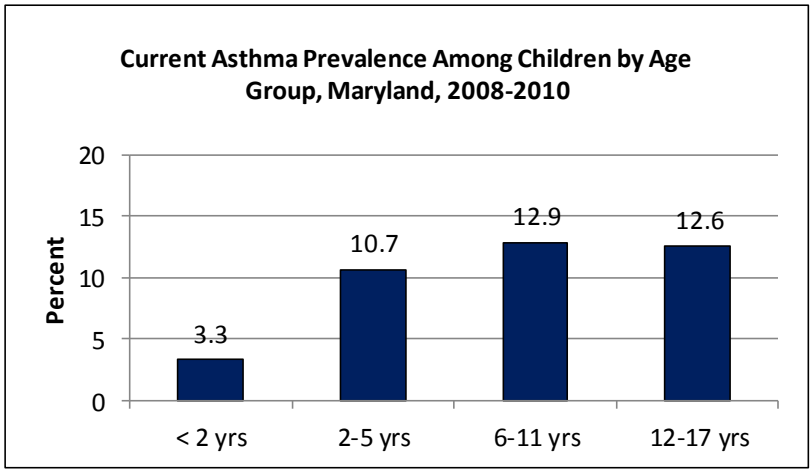
[a] Survey question for current asthma prevalence changed in 2005, data from 2001-2004 are not comparable to 2005-2010 data.

[b] BRFSS data for children is not collected in all states, each year the number of states collecting data on child asthma prevalence has been between 22 and 37 states.

PREVALENCE - Children

Averaging 2008 and 2010 data, the prevalence of current asthma was lowest among children less than 2 years old (3.3%); this age group was statistically lower than the older age groups.

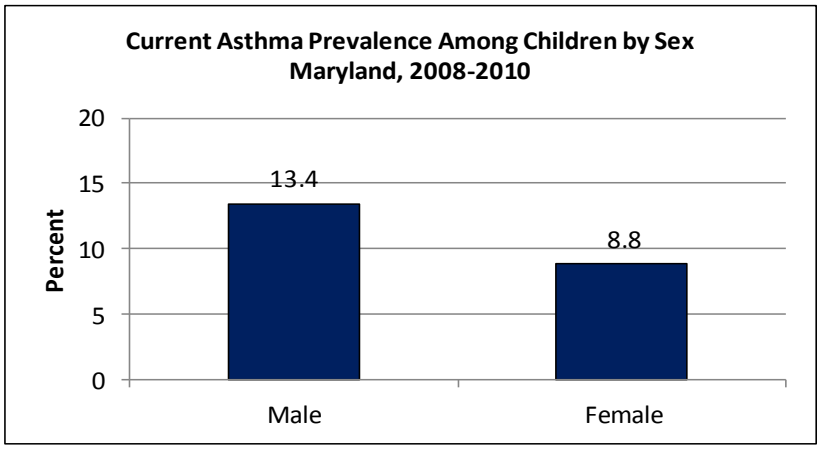
Figure 1-11



Maryland BRFSS, 2008-2010.

Averaging 2008-2010 data, male children in Maryland had a current asthma prevalence (13.4%) that was significantly higher than the current asthma prevalence among female children (8.8%).

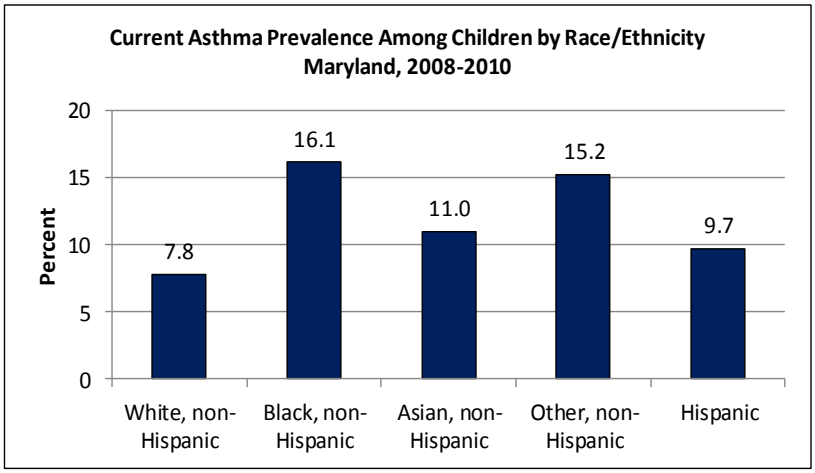
Figure 1-12



Maryland BRFSS, 2008-2010.

Averaging 2008 and 2010 data, the current asthma prevalence was significantly higher for Black, non-Hispanic children (16.1%) compared to White, non-Hispanic children (7.8%) and Hispanic children (9.7%).

Figure 1-13



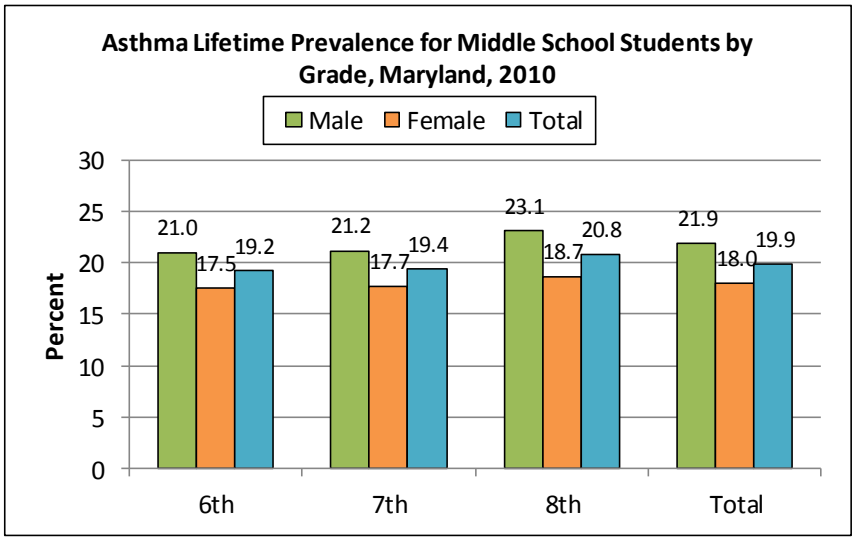
Maryland BRFSS, 2008-2010.

PREVALENCE - Children

In 2010, approximately 19.9% of middle school children reported having ***ever been diagnosed*** with asthma, defined as lifetime asthma prevalence.

There were significant differences between the sexes for every middle school grade, with males having a higher lifetime prevalence than females.

Figure 1-14

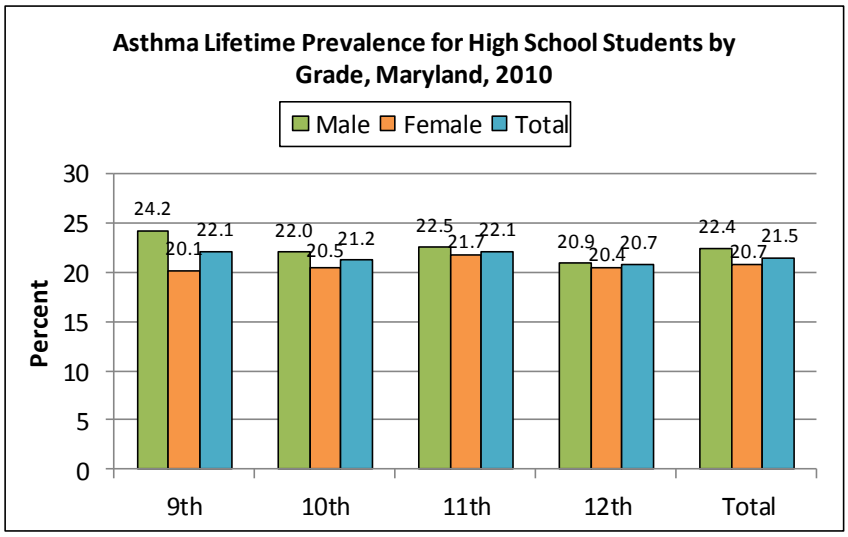


Maryland Youth Tobacco Survey, 2010.

In 2010, approximately 21.5% of high school children reported having ***ever been diagnosed*** with asthma.

Males in 9th grade had a significantly higher prevalence of asthma compared to 9th grade females.

Figure 1-15



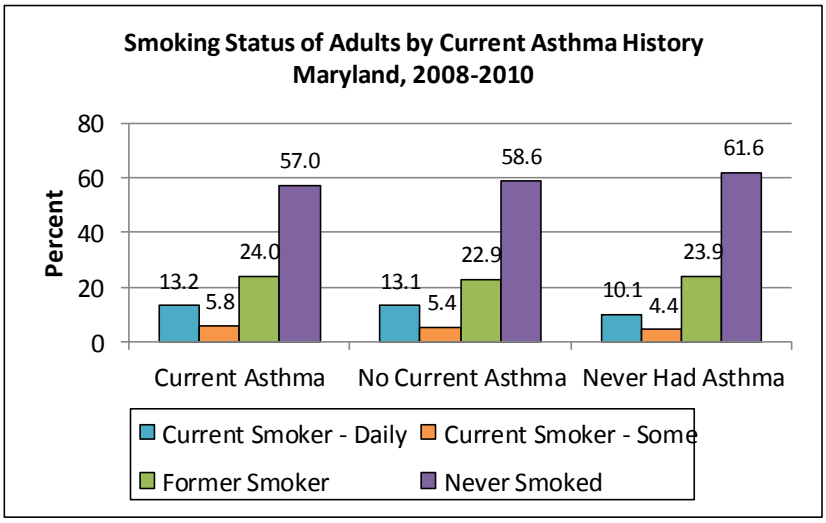
Maryland Youth Tobacco Survey, 2010.

RISK FACTORS AND PREVENTATIVE BEHAVIORS

Tobacco is a risk factor associated with asthma. Maryland adults with asthma reported being a current smoker 'daily' (13.2%) significantly more and reported 'never smoked' (57.0%) significantly less than adults who never had asthma (10.1%, 61.6%).

A cause/effect relationship cannot be determined with cross-sectional data; therefore, the directional relationship between asthma and smoking cannot be summarized by this figure.

Figure 2-1

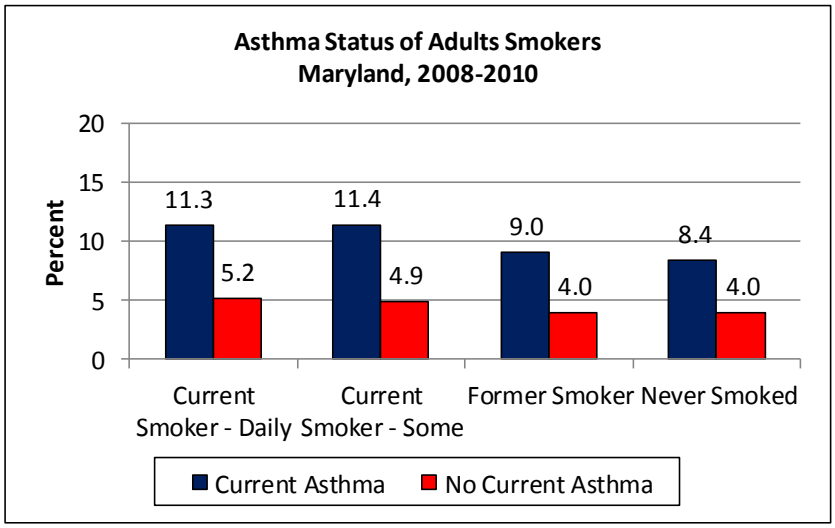


Maryland BRFSS, 2008-2010.

The prevalence of current asthma is statistically higher among adults who smoke daily (11.3%) than among those who have never smoked (8.4%).

Again, because this data is cross-sectional, it is not possible to determine whether smoking caused asthma among adults.

Figure 2-2



Maryland BRFSS, 2008-2010.

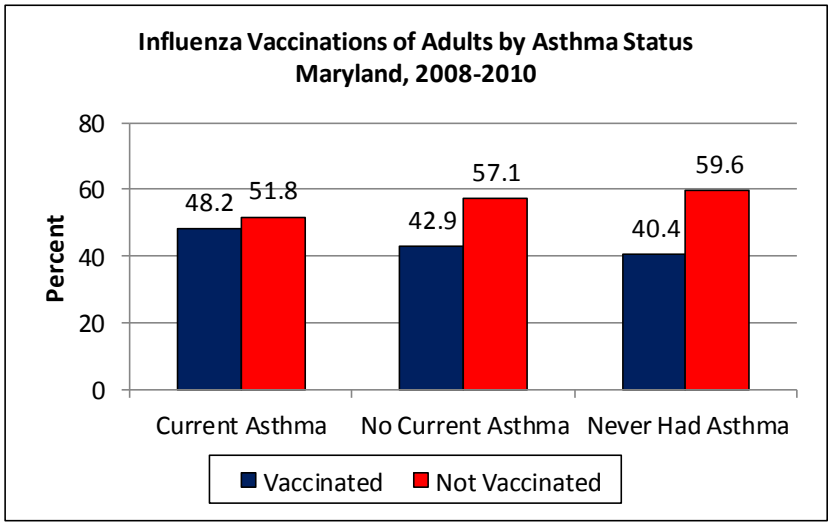
[a] Asthma status 'Never Had Asthma' not included in figure; data available in Appendix A.

RISK FACTORS AND PREVENTATIVE BEHAVIORS

Influenza is associated with substantial morbidity especially among people with asthma. The CDC recommends persons with asthma receive vaccination against influenza to reduce morbidity and mortality.

Averaging 2008-2010 data, the percent of adults with current asthma that received the influenza vaccination (48.2%) was significantly higher than adults receiving the vaccine that never had asthma (40.4%).

Figure 2-3

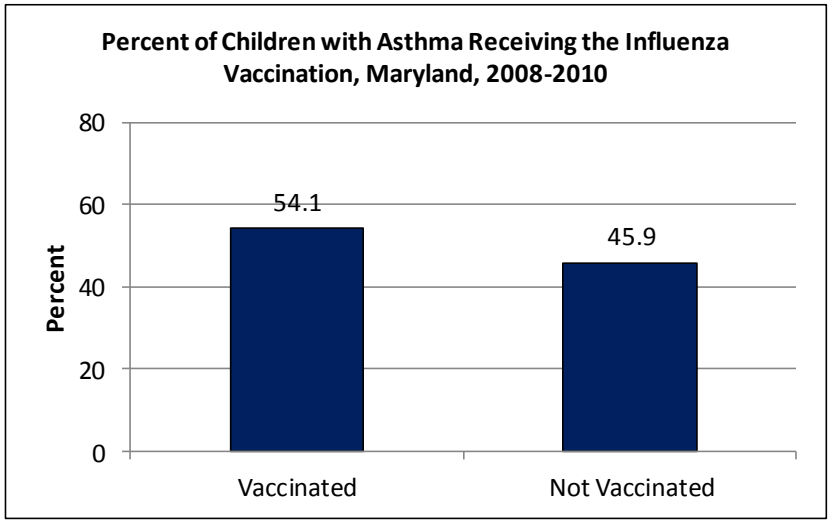


Maryland BRFSS, 2008-2010.

More than half the children ages 0 to 17 with current asthma received a flu vaccination during the past 12 months (54.1%).

There was no statistical difference between the percentage of children with current asthma receiving a vaccination and children with current asthma not receiving a vaccination.

Figure 2-4



Maryland BRFSS Call-back Survey, 2008-2010.

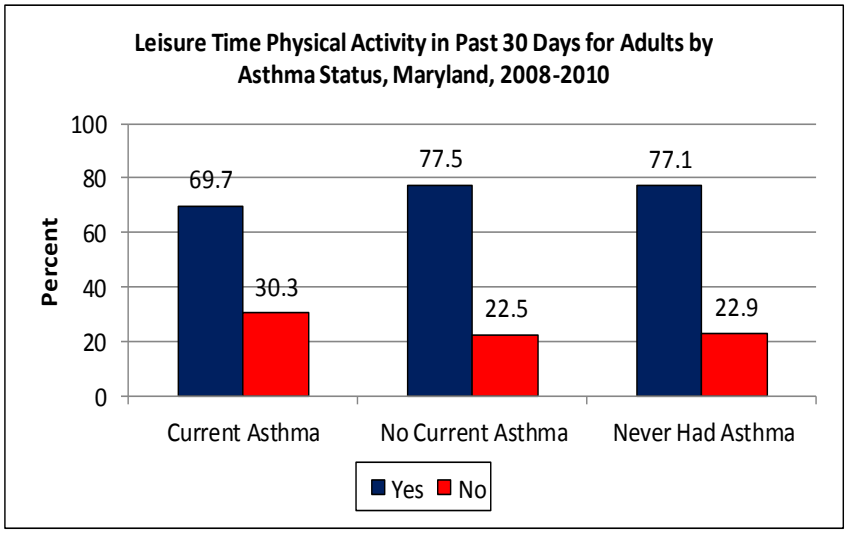
RISK FACTORS AND PREVENTATIVE BEHAVIORS

Individuals with asthma should not be limited in their ability to participate in physical activities. Additionally, physical activity levels may be a potential indicator of how well asthma is under control.

Adults with asthma had statistically less leisure time physical activity in the past 30 days than adults without asthma in Maryland.

30.3% of adults with current asthma and 22.5% of adults with no current asthma reported that they had no leisure time physical activity in the past 30 days.

Figure 2-5



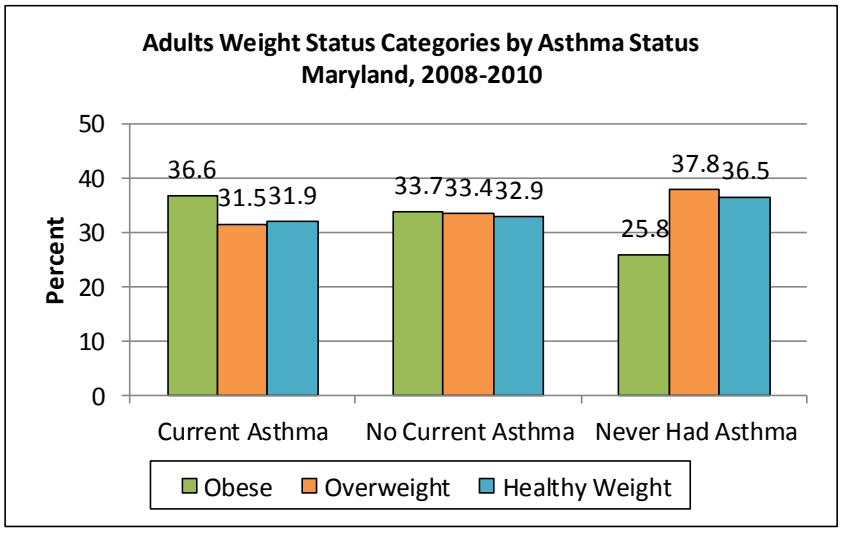
Maryland BRFSS, 2008-2010.

Body mass index (BMI) is a measure of body fat based on height and weight. For the data associated with the figure below, BMI is based on the BRFSS respondent's self-reported height and weight. The CDC defines overweight as a BMI between 25.0 and 29.9, and obese as a BMI greater than or equal to 30.[17]

In Maryland, adults with current asthma are statistically more likely to be obese (36.6%) compared to adults that never had asthma (25.8%).

From this data, it cannot be determined whether people who are overweight/obese are more likely to develop asthma or whether people with asthma are more likely to become overweight/obese because asthma has caused them to limit their activities.

Figure 2-6



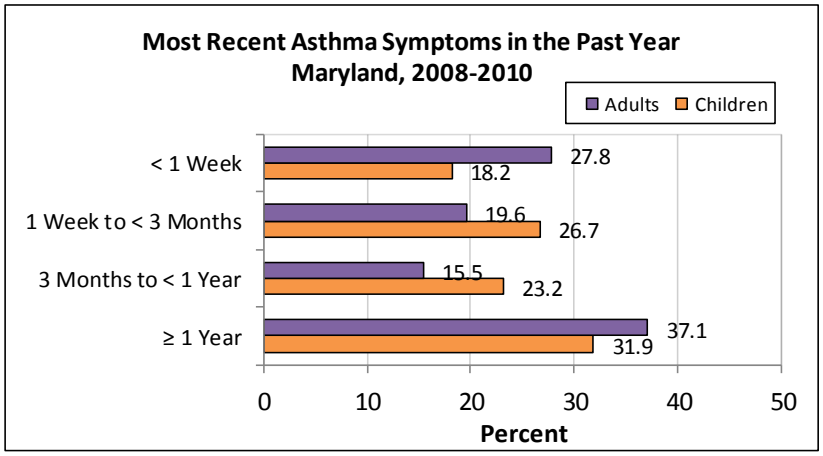
Maryland BRFSS, 2008-2010.

HEALTH STATUS OF MARYLAND ASTHMATICS

In 2007, Maryland began participating in the BRFSS Asthma Call-back Survey sponsored by the Centers for Disease Control and Prevention and the National Asthma Control Program. Respondents to the Maryland BRFSS who had ever been diagnosed with asthma or whose randomly selected child had ever been diagnosed with asthma were asked at the end of the Maryland BRFSS interview if they would be willing to participate in an additional interview focused on asthma. Those who agreed were called back and asked more extensive questions about their experience with the disease. About 450 Maryland adults aged 18 and up and about 250 Maryland children participated in the Asthma Call-back Survey each year. Results were weighted to reflect statewide demographics. Data from 2008, 2009, and 2010 BRFSS Asthma Call-back Surveys were combined in order to increase the total sample size and decrease the range of error. However, due to the nature of responses for asthma, the sample size is low, especially for children. Therefore, data presented in this report represent estimates of actual rates and should be interpreted with caution.* The survey provides a more extensive number of measures related to the burden of asthma in Maryland including asthma management and quality of life, healthcare utilization, access to care, disease co-morbidities, and work related asthma.

Figure 3-1

Averaging 2008-2010 data, almost one in three adults (27.8%) and almost one in five children (18.2%) with asthma experienced their most recent asthma symptom less than one week ago.

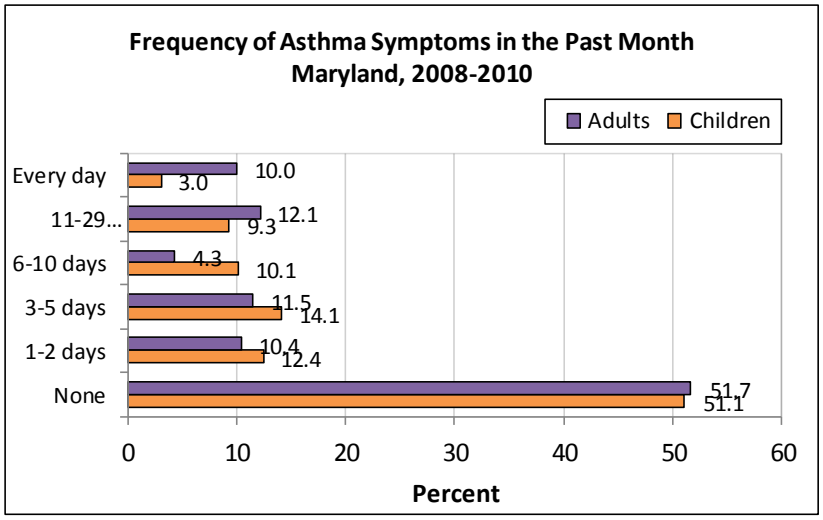


Maryland BRFSS Call-back Survey, 2008-2010.

Figure 3-2

Averaging 2008-2010 data, only 51.7% of adults with asthma were symptom free during the past month and 10.0% of adults had symptoms every day during the past month.

For children, 51.1% were symptom free during the past month and 3.0% had symptoms everyday.

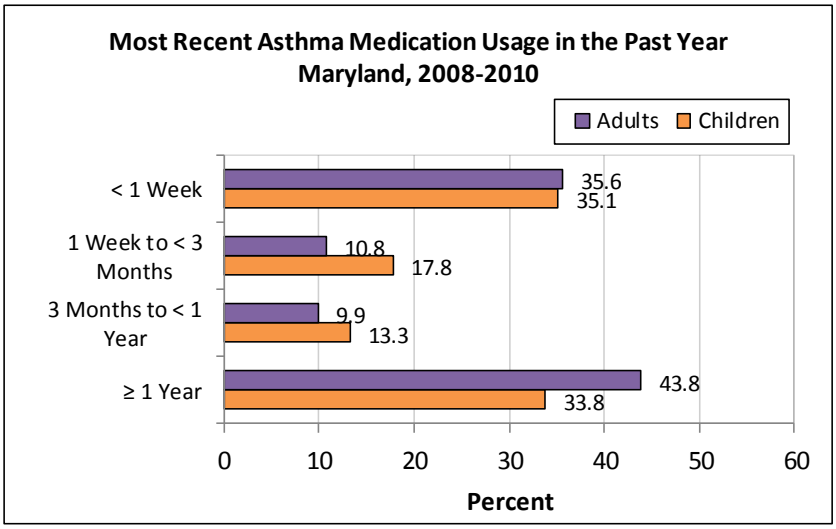


* Even though the overall number of responses may be adequate for statistical inference purposes, sub-analysis of particular questions can lead to estimators that are unreliable. Consequently, particular attention should be paid to the subgroup sample size. Small sample sizes may produce unreliable estimates. Interpreting rates based on a small number of respondents can mislead the reader into overestimating the validity of the results. Interpretation of data with only a small number of respondents should be done with caution.

HEALTH STATUS OF MARYLAND ASTHMATICS

Averaging 2008-2010 data, 43.8% of adults and 33.8% of children with asthma hadn't used prescription asthma medication in over a year.

Figure 3-3

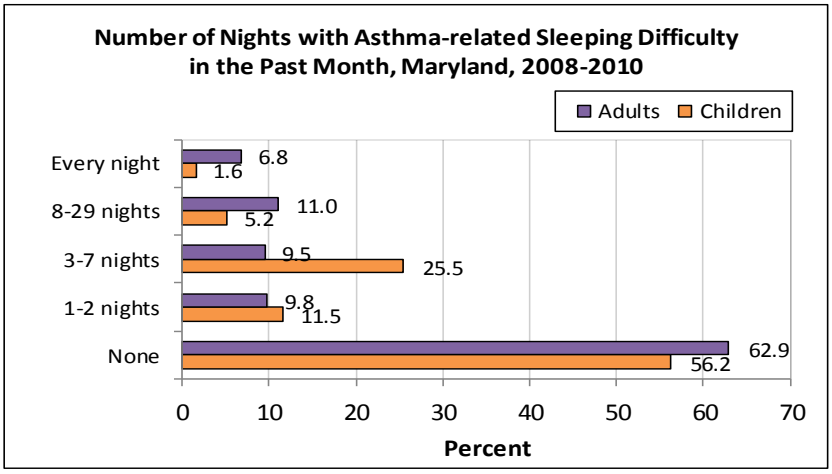


Maryland BRFSS Call-back Survey, 2008-2010.

Averaging 2008-2010 data, 62.9% of adults and 56.2% of children reported no difficulty sleeping over the past month as a result of their asthma.

6.8% of adults and 1.6% of children reported difficulty sleeping every night over the past month.

Figure 3-4

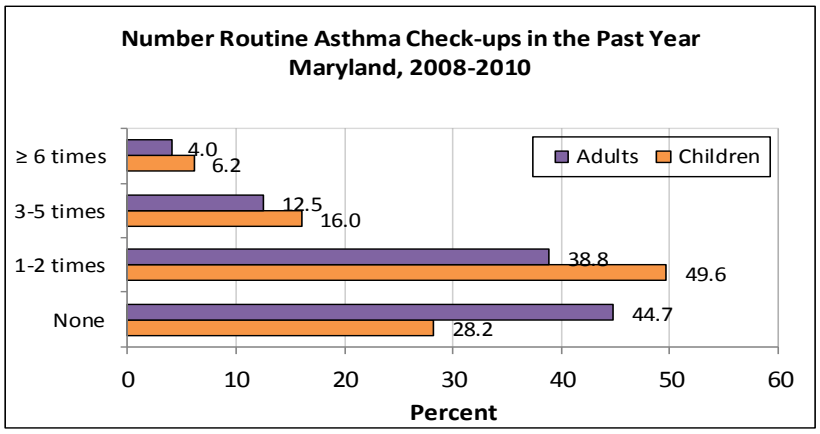


Maryland BRFSS Call-back Survey, 2008-2010.

HEALTH STATUS OF MARYLAND ASTHMATICS

Averaging 2008-2010 data, 38.8% of adults and 49.6% of children had 1-2 routine check-ups for their asthma in the past year.

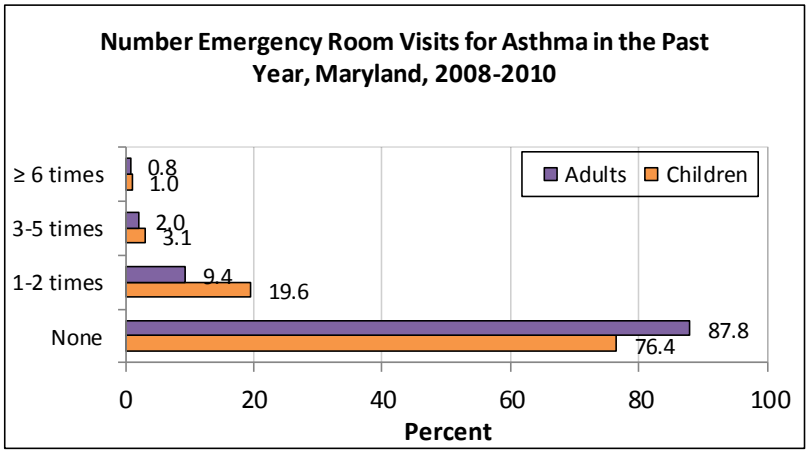
Figure 3-5



Maryland BRFSS Call-back Survey, 2008-2010.

Averaging 2008-2010 data, 87.8% of adults and 76.4% of children had no visits to the emergency room for their asthma during the past year.

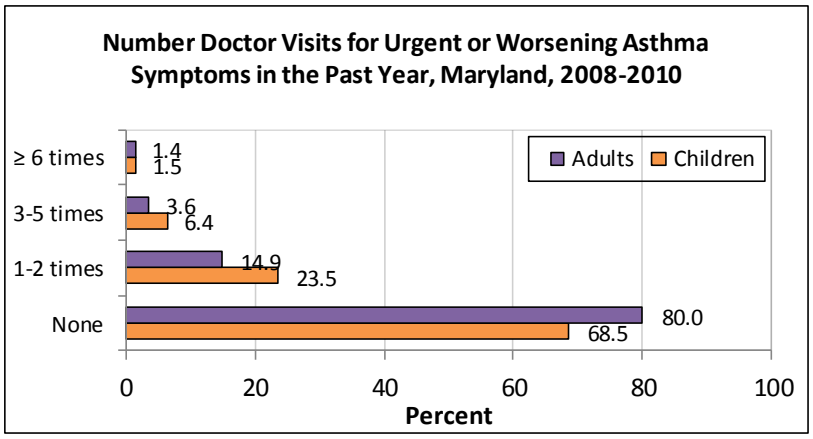
Figure 3-6



Maryland BRFSS Call-back Survey, 2008-2010.

Averaging 2008-2010 data, 80.0% of adults and 68.5% of children with asthma did not see a doctor at least once during the past year for urgent or worsening asthma symptoms.

Figure 3-7



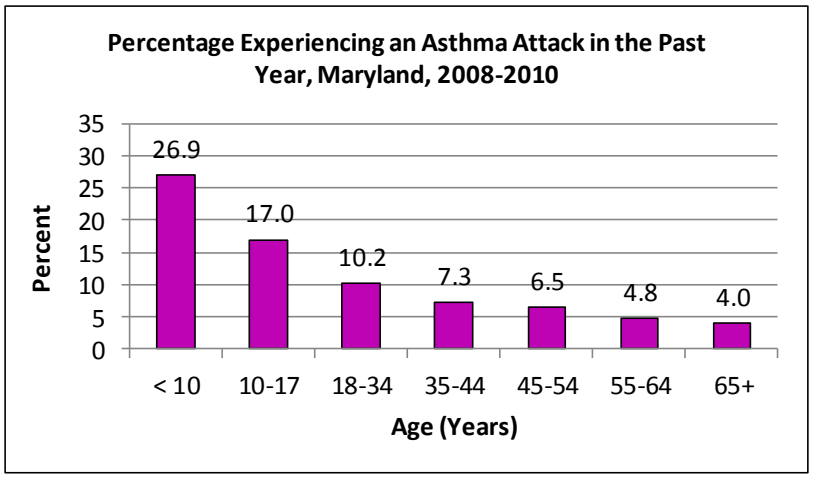
Maryland BRFSS Call-back Survey, 2008-2010.

HEALTH STATUS OF MARYLAND ASTHMATICS

Averaging 2008-2010 data, over one in four children less than 10 years old (26.9%) experienced an asthma attack during the past year.

A significantly higher percentage of adults in the age group 18-34 (10.2%) experienced an asthma attack in the past year compared to adults in the age groups of 55-64 (4.8%) and 65 years and older (4.0%).

Figure 3-8

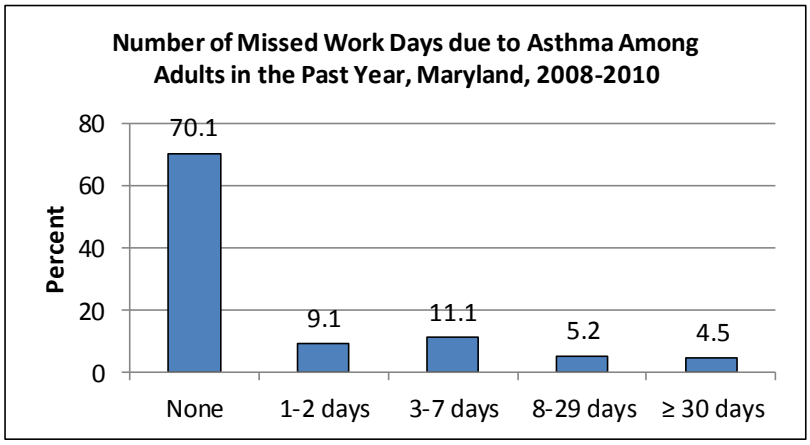


Maryland BRFSS Call-back Survey, 2008-2010.

Averaging 2008-2010 data, 70.1% of Maryland adults with asthma had no symptoms in the past year that interfered with work or usual activities.

Only 4.5% of Maryland adults with asthma had 30 or more days of asthma symptoms in the past year that interfered with their work or usual activities.

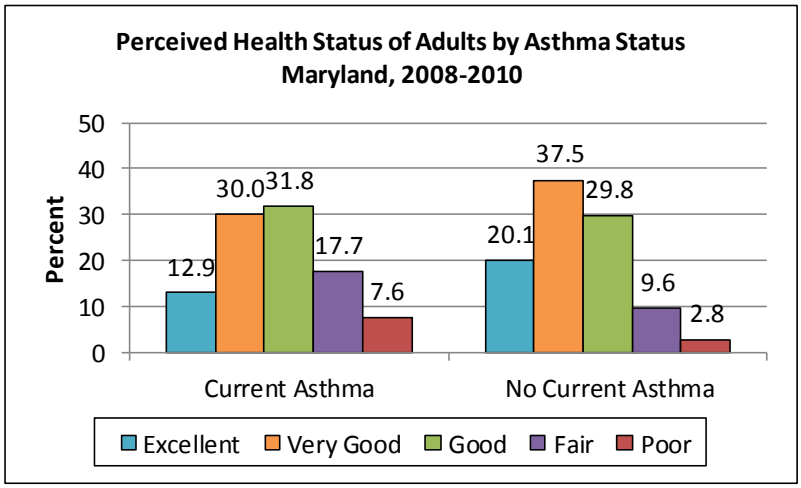
Figure 3-9



Maryland BRFSS Call-back Survey, 2008-2010.

Averaging 2008-2010 data, adults in Maryland with current asthma reported their health to be significantly less Excellent, significantly less Very Good, significantly more Fair, and significantly more Poor than those without current asthma.

Figure 3-10



Maryland BRFSS, 2008-2010.

ASTHMA SELF-MANAGEMENT KNOWLEDGE

Table 4.1: Asthma Self-Management Knowledge, Maryland, 2008-2010

	Adult (18+) 2008-2010 Weighted Percent (95% CI)	Child (0-17) 2008-2010 Weighted Percent (95% CI)
Taught to recognize early signs or symptoms.	41.9 (21.8 - 62.1)	84.5 (66.5 - 100.0)
Taught what to do during an asthma episode or attack.	53.8 (31.9 - 75.7)	75.9 (44.8 - 100.0)
Taught to use a peak flow meter to adjust daily medication.	41.7 (20.6 - 62.8)	52.2 (14.4 - 90.1)
Given an asthma action plan.	12.6 (0.0 - 25.9)	53.8 (22.7 - 85.0)
Taken a course or class on how to manage asthma.	2.3 (0.0 - 5.3)	8.5 (0.0 - 24.1)

Maryland BRFSS Call-back Survey, 2008-2010.

Asthma self-management education is an integral part of effective asthma care and improves patient outcomes by empowering patients to self-manage their asthma in accordance with healthcare provider's management and medication instructions for daily and emergency care. It is recommended that health care providers teach self-management skills by providing every asthma patient with a written asthma action plan and encouraging self-monitoring and self-management of asthma symptoms.

Between 2008 and 2010, 84.5% of parents of children with current asthma reported that either they or their children were taught by a health professional to recognize early signs or symptoms of an asthma episode. This is significantly higher than the percent of adults with current asthma who reported being taught to recognize signs or symptoms of an asthma episode (41.9%).

ASTHMA MEDICATION USE

Table 5.1: Asthma Medication Use Among Adults and Children, Maryland, 2008-2010

	Adult (18+) 2007-2009 Weighted Percent (95% CI)	Child (0-17) 2007-2009 Weighted Percent (95% CI)
Ever used over-the-counter-medication.	27.5 (23.1 - 31.9)	15.1 (10.1 - 20.2)
Ever used a prescription inhaler.	90.1 (87.4 - 92.7)	83.7 (78.5 - 88.8)
Taught to use a prescription inhaler.	86.6 (83.7 - 89.5)	79.4 (73.7 - 85.1)
Taken prescription asthma medication using an inhaler during the past 3 months.	39.1 (34.6 - 43.5)	40.9 (34.0 - 47.7)
Taken asthma medication in pill form during the past 3 months.	14.0 (10.5 - 17.6)	16.5 (11.3 - 21.6)
Taken asthma medication using a nebulizer during the past 3 months.	11.0 (7.9 - 14.2)	24.5 (18.2 - 30.8)

Maryland BRFSS Call-back Survey, 2008-2010.

The BRFSS Call-back Survey asked adults and children with asthma about their medication usage. Adults and children that had never taken asthma medication were not included in the results above.

A significantly higher percentage of adults with current asthma have used over-the-counter asthma medications when compared to children (27.5% vs. 15.1%). Reported adults and children were not significantly different in prescription inhaler usage or being taught by health professional how to use a prescription inhaler.

During the past 3 months, significantly more children were reported taking asthma medication using a nebulizer (24.5%) compared to adults (11.0%). Taking asthma medication using an inhaler and in pill form were comparable in adults and children during the past 3 months.

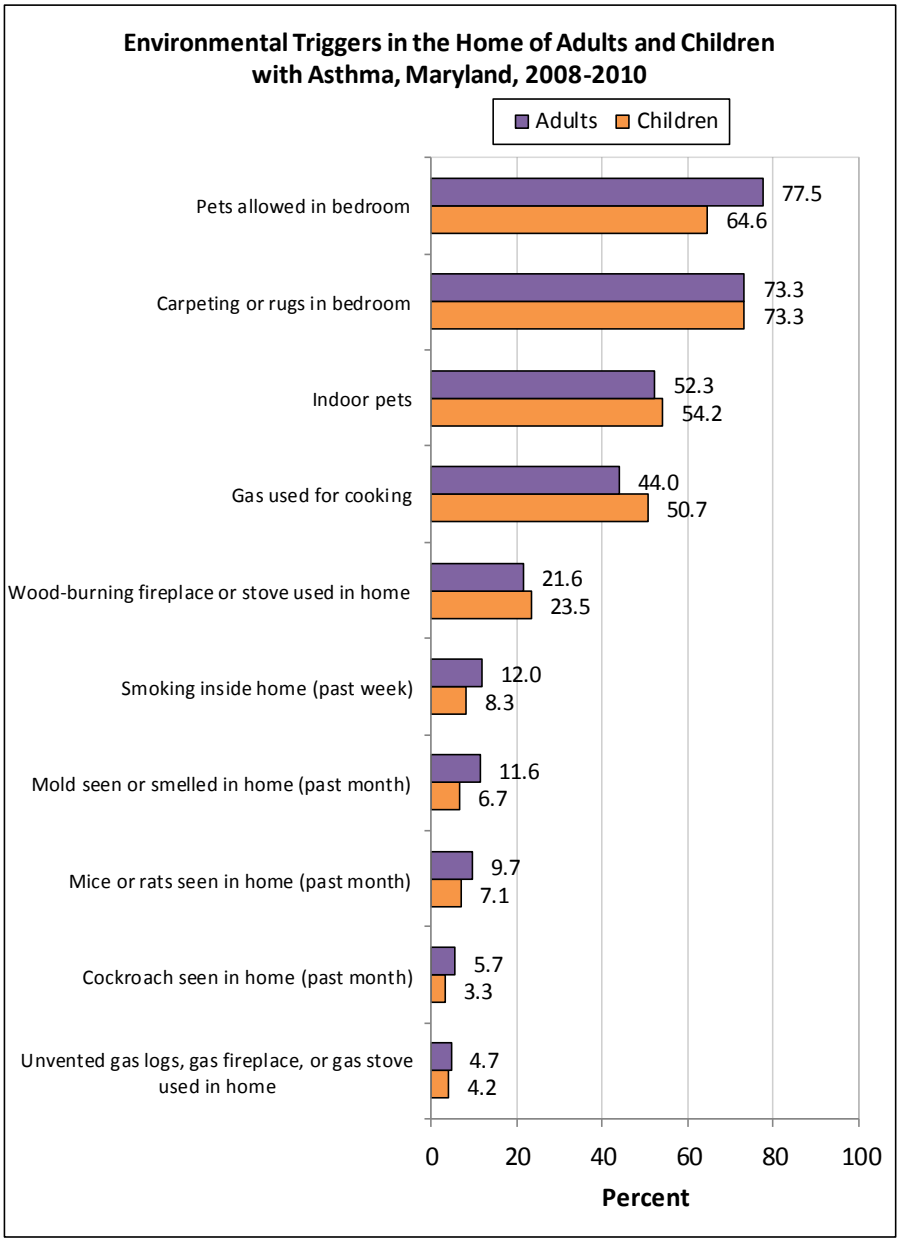
INDOOR ENVIRONMENTAL EXPOSURES

People generally spend the majority of their time indoors, therefore indoor environmental factors in the home and workplace can play a significant role in asthma morbidity. Common indoor asthma triggers include secondhand smoke, dust mites, mold, cockroaches and other pests, household pets, and combustion by-products. Gas cook tops and ovens, wood stoves and fireplaces, and room-vented gas or kerosene heaters are sources of combustion gases, particularly carbon monoxide, nitrogen oxides, sulfur oxides, and excess moisture.

The majority of adults and children in Maryland reported the highest exposure to the following environmental triggers: pet allowed in the bedroom, carpeting/rugs in bedroom, having pets inside the home, and using gas for cooking.

Less than 25% of respondents reported exposure to the other indoor triggers. Exposure to indoor asthma triggers was similar for adults and children.

Figure 6-1



Maryland BRFSS Call-back Survey, 2008-2010.

INDOOR ENVIRONMENTAL EXPOSURES

Environmental modifications can be made in the home to increase indoor air quality and reduce exposure to indoor asthma triggers and thus improve asthma symptoms.

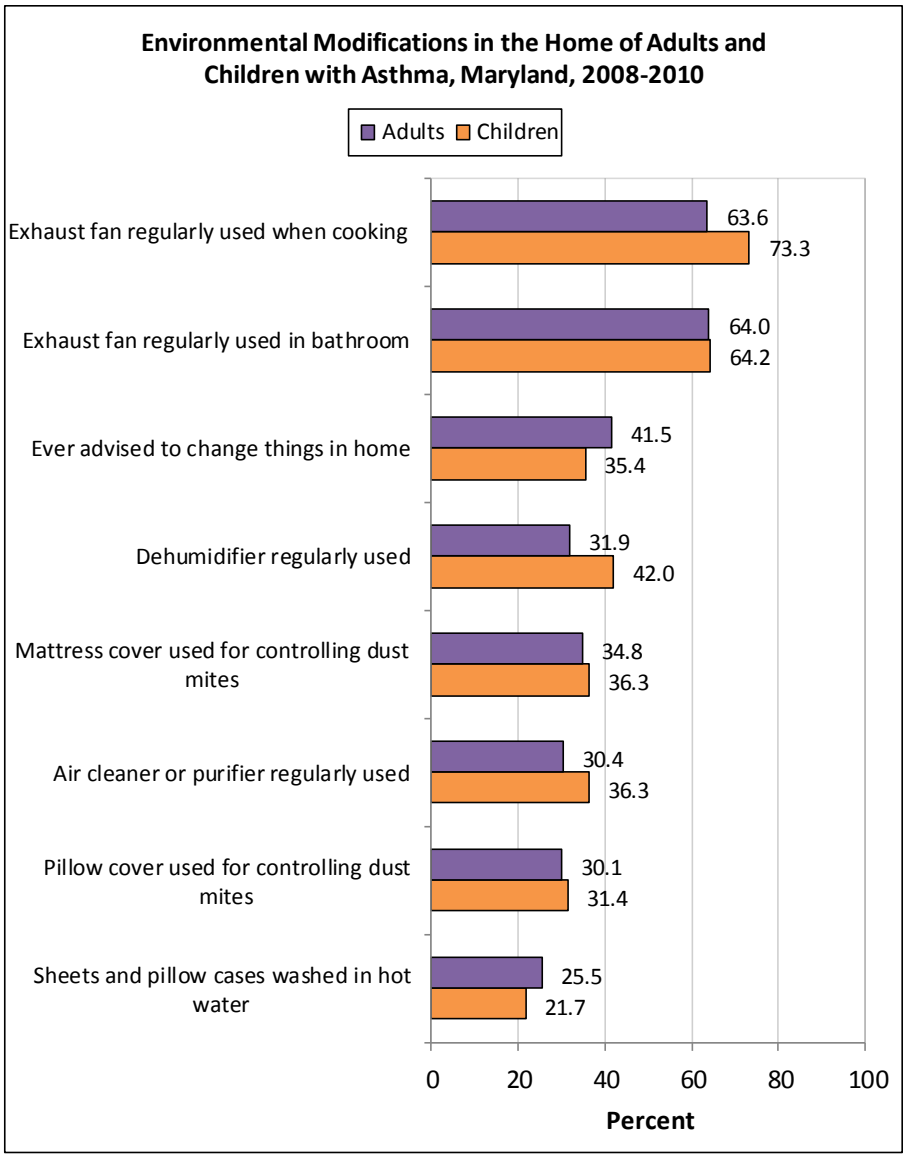
Methods to increase indoor air quality include providing adequate ventilation, eliminating indoor tobacco smoking, properly venting and maintaining combustion appliances like furnaces, controlling moisture, and using cleaners, paints, and building materials that have low emissions of volatile organic compound (VOCs). VOCs are organic compounds that evaporate at a relatively low temperature and contribute to air pollution. Examples of VOCs include ethylene, propylene, benzene, and styrene.

More than half of adults and children with asthma lived in homes where exhaust fans were regularly used in the bathroom or when cooking.

Other environmental modifications were implemented in approximately two-fifth or fewer homes.

Environmental modifications were similar in homes of adults and children with asthma.

Figure 6-2



Maryland BRFSS Call-back Survey, 2008-2010.

WORK-RELATED ASTHMA

Work-Related Asthma is defined as:

1) Asthma that is caused by exposure to substances in the work environment.

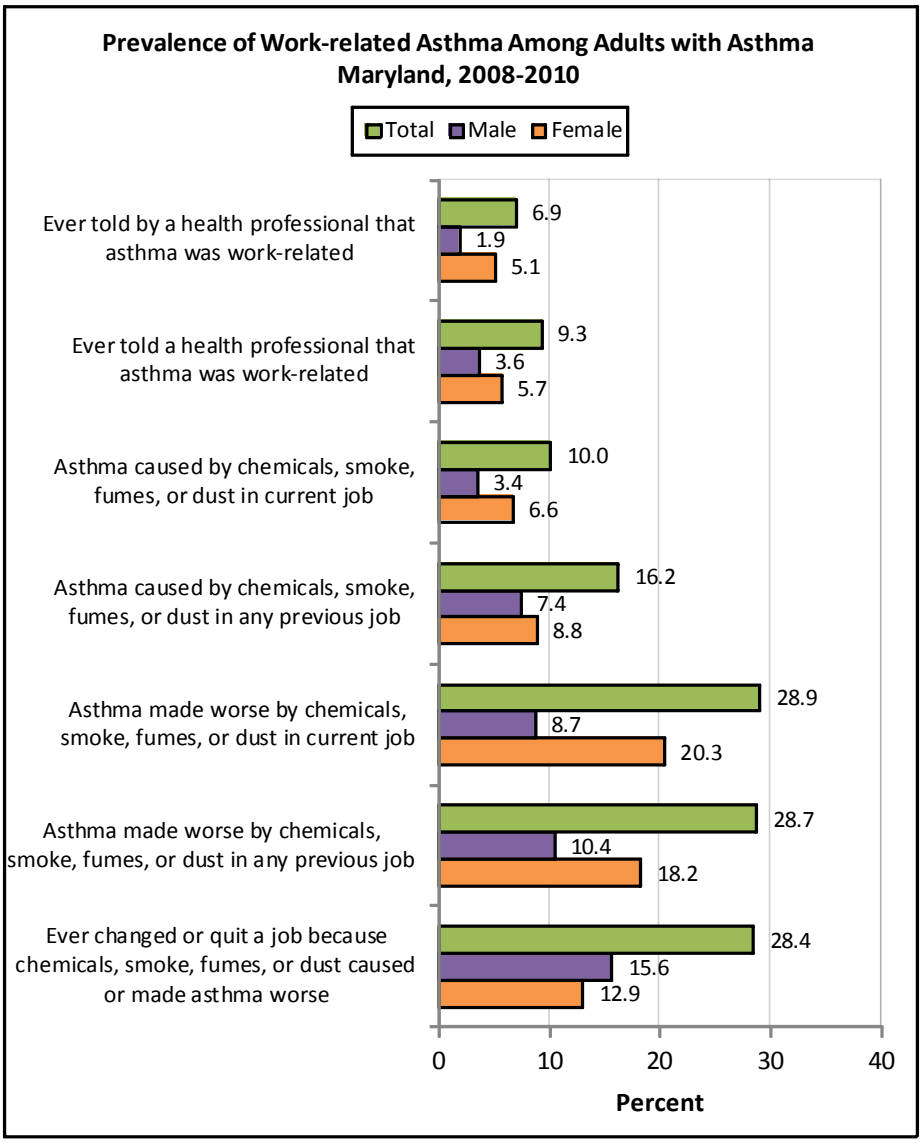
2) Pre-existing asthma that is triggered or made worse by exposure to one or more substances in the work environment.

Averaging 2008 and 2010 data, 6.9% of adults with asthma said that a health professional has told them their asthma was work-related and 9.3% said they have told a health professional that their asthma was work-related.

A statistically higher percentage of females with asthma believed that their asthma was made worse by their current (20.3%) or previous (18.2%) jobs when compared to males (8.7, 10.4%). A statistically higher percentage of females vs. males reported being told by a health professional that their asthma was work-related (5.1 vs. 1.9).

Nearly one-third of individuals reported having left a job because it caused or worsened their asthma symptoms (28.4%).

Figure 7-1



Maryland BRFSS Call-back Survey, 2008-2010.

COMORBID CONDITIONS

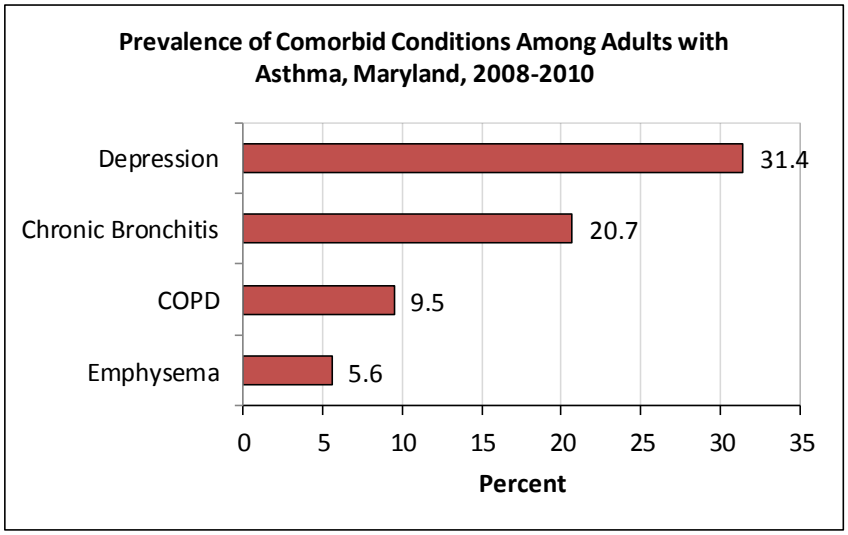
Asthma commonly coexists with other major health problems, particularly in older age groups. This coexistence is associated with significant adverse effects on physical health and accounts for significant morbidity and cost. Comorbidity can influence the quality of life and the functional status of people with asthma.

COPD is a broad term that encompasses both emphysema and chronic bronchitis. Because COPD is a relatively new term and because some individuals may know the condition by different names (COPD, emphysema, or chronic bronchitis), the Asthma Call-back Survey includes separate questions about the respondent's history of COPD, emphysema, and chronic bronchitis.

Overall, 35.8% of adults with asthma reported that they have been diagnosed with some form of COPD (chronic bronchitis, COPD, and/or emphysema). Chronic bronchitis alone was reported in almost a quarter of adults with current asthma.

Approximately 31.4% of adults with asthma had been diagnosed with depression.

Figure 8-1



Maryland BRFSS Call-back Survey, 2008-2010.

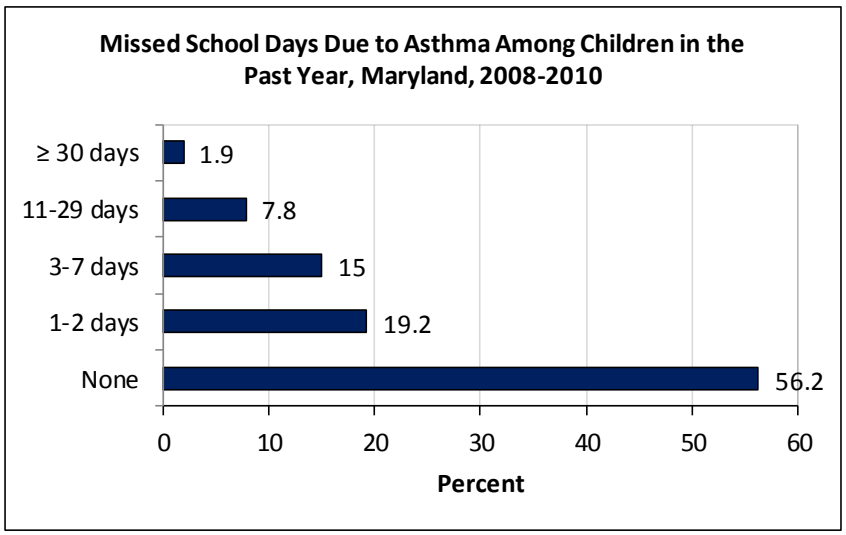
The directional relationship between asthma and these comorbid conditions cannot be summarized by this figure. A cause/effect relationship cannot be determined with cross-sectional data; therefore, these findings do not imply that having asthma leads to any of these conditions or having a comorbid condition leads to asthma. It is clear that there is an association between these conditions, but more research is needed to determine exactly how they are related.

ASTHMA AMONG SCHOOL-AGE CHILDREN

Nationally, asthma is one of the leading causes of school absenteeism - 10.5 million school days are missed each year due to asthma.[17]

Asthma contributes to school absenteeism in Maryland. 19.2% of parents reported that their child missed 1-2 days of school because of asthma during the past year and 9.7% said their child missed over 7 days due to asthma (8-29 days and 30+ days combined). Over half of parents (56.2%) reported that their child missed no days of school due to asthma.

Figure 9-1

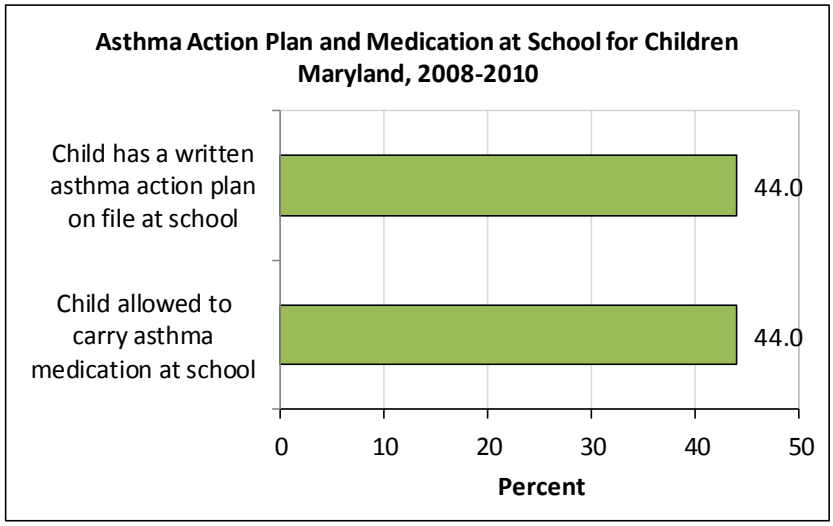


Maryland BRFSS Call-back Survey, 2008-2010.

The Maryland Asthma Control Program encourages schools to maintain a written asthma action plan on file for all students with current asthma.

Averaging 2008 and 2010 data, only 44.0% of parents of children with current asthma reported that their children had an asthma action plan on file at their school.

Figure 9-2



Maryland BRFSS Call-back Survey, 2008-2010.

In 2005, the Maryland General Assembly passed legislation (House Bill 143) creating a new statute, §7-421 of the Education Article, Annotated Code of Maryland, which requires public school systems to adopt policies authorizing students to possess and self-administer an asthma inhaler or other emergency medication for treatment of asthma or other airway constricting disease. However, between 2008 and 2010, only 44.0% of parents reported that their children were allowed to carry their asthma medications at school.

EMERGENCY DEPARTMENT VISITS

Individuals with asthma can usually manage their condition through the avoidance of triggers, appropriate use of medications, and appropriate health care by a primary care provider and specialty consultation as needed. Emergency department (ED) visits occur when persons with asthma develop symptoms that cannot be managed at home. This may be due to lack of appropriate care or failed self-management.

Information regarding ED visits for asthma is obtained from the Maryland Health Services Cost Review Commission (HSCRC) ambulatory care file. HSCRC currently collects health record level detail on patient demographics, diagnoses, services, residence location, and charges for every ED visit in Maryland. Data have been collected for non-federal hospitals within Maryland since April 1997. Although these data do not represent all persons with asthma, they provide a picture of individuals with the most severe or poorly controlled asthma and those who may not have adequate access to preventive or specialty care.

Data presented here are for all Maryland residents who visited the ED with a principal diagnosis of asthma from 2002 to 2010. The data are based upon the number of visits to the ED and not the number of unique individuals who visited the ED. The crude and age-adjusted rates for asthma ED visits can be found in Appendix C, Table C-1.

An asthma ED visit is defined as an ED visit with a principal diagnosis of asthma; an ICD-9 CM code of 493-493.9. ED visit numbers and rates presented in this report may differ from prior reports due to changes in data collection and analysis methods.*, †

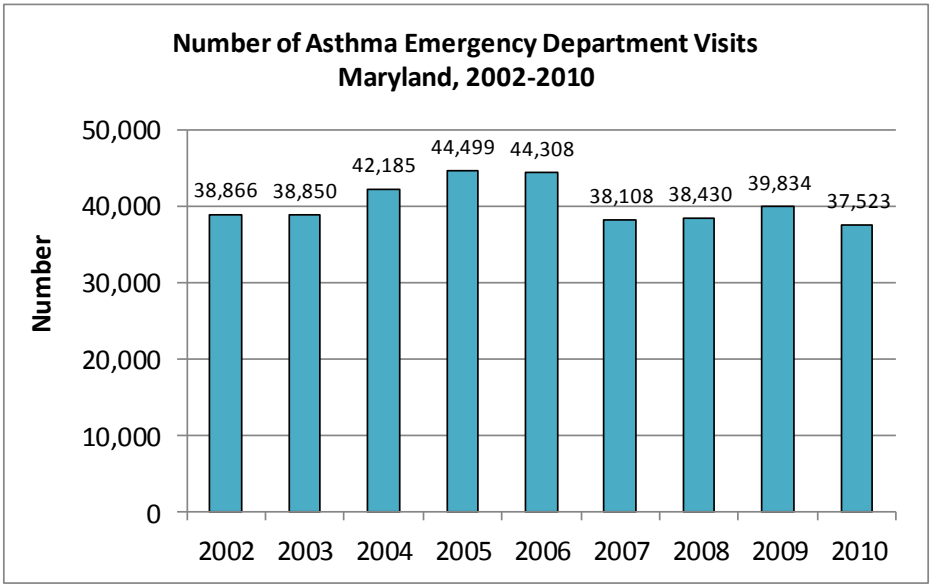
* In reports prior to 2002, ED visits were determined by admission date. Current reports determine ED visits by discharge date. Additionally, rather than creating zip code-specific county data, county-specific data provided by HSCRC was used in the analysis of ambulatory discharge data for reports created on or after 2006. County-specific data is more accurate since many of the zip codes belong to more than one county.

† Data collection methodology changed in July of 2007 - ED visits prior to 2007 are not comparable to 2007 and beyond. Reports prior to 2007 data presented ED visits determined by encounter type. Data after 2007 determines ED visits are determined by ED charges.

EMERGENCY DEPARTMENT VISITS - Continued

In 2010, there were 37,523 ED visits in Maryland with asthma as a principal diagnosis.

Figure 10-1

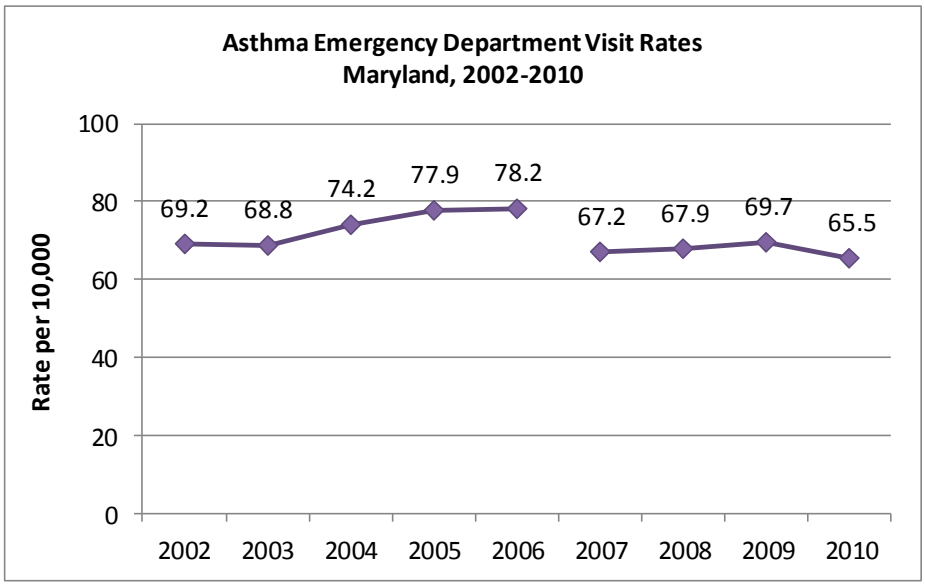


Maryland HSCRC, 2002-2010.

[a] ED data collection methodology changed in July 2007; therefore, data years 2006 and before are not comparable to 2007 and beyond.

The overall rate of ED visits due to asthma was 65.5 per 10,000 population in 2010.

Figure 10-2



Maryland HSCRC, 2002-2010.

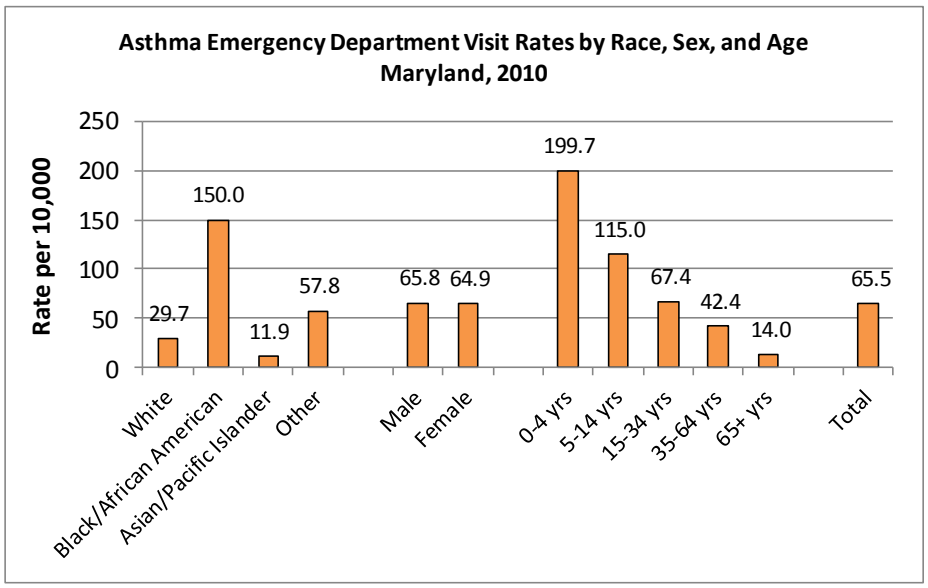
[a] ED data collection methodology changed in July 2007; therefore, data years 2006 and before are not comparable to 2007 and beyond.

EMERGENCY DEPARTMENT VISITS - Continued

Asthma ED visits for Black/ African Americans in Maryland were significantly higher than the rate of Whites (150.0 vs. 29.7 per 10,000).

Young children are brought to the ED for asthma more often than adults.

Figure 10-3



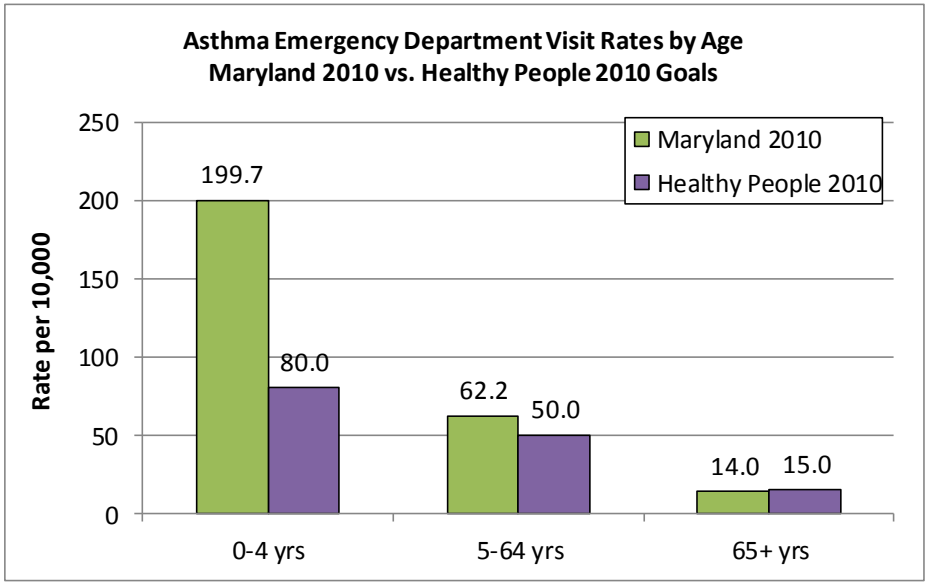
Maryland HSCRC, 2010.
Rates are age-adjusted to the 2010 U.S. standard population.

In 2010, asthma ED visit rates exceed the Healthy People 2010 goals for the age groups of 0 to 4 year olds and 5 to 64 year olds.[19]

This difference remains most dramatic for children under 5 years of age. The Healthy People 2010 goal is 80 visits per 10,000 population, yet Maryland's youngest children (ages 0-4) had 199.7 visits per 10,000 population.

In the age group of older adults, 65 years of age and older, the Healthy People 2010 asthma ED visit goal was met in Maryland.

Figure 10-4



Maryland HSCRC, 2010; DATA2010 Healthy People 2010 Database, U.S. Department of Health and Human Services, 2010.
[a] Rates are age-adjusted to the 2010 U.S. standard population.

HOSPITALIZATIONS

Hospitalizations for asthma, like emergency department visits, are generally considered a failure of outpatient management. Maryland hospitalization data from 2001-2010 were obtained from the Maryland Health Services Cost Review Commission (HSCRC) hospital discharge files. HSCRC currently collects health record level detail on patient demographics, diagnoses, treatments, services, residence location, and charges for every hospital discharge in Maryland. Although the data does not represent all persons with asthma, they provide a picture of those people with the most severe or poorly controlled asthma, and those who may not have adequate access to preventive care.

Data are presented for all Maryland residents discharged from the hospital with a principal diagnosis of asthma from 2001 to 2010. The data, which lacks unique identifiers, is based upon the number of admissions to the hospital and not the number of individuals who were admitted to the hospital. The crude and age-adjusted rates for asthma ED visits can be found in Appendix C, Table C-2. Since some Maryland residents are hospitalized in neighboring states, data on hospitalization of Maryland residents from Delaware, Pennsylvania*, and Washington D.C. are included when possible.

An asthma hospital discharge is defined as a hospitalization with principal diagnosis of asthma; an ICD-9 CM code of 493.0-493.9. Hospitalization numbers and rates presented in this report may differ from prior reports due to changes in analysis methods.†

* "The Pennsylvania Health Care Cost Containment Council (PHC4) is an independent state agency responsible for addressing the problem of escalating health costs, ensuring the quality of health care, and increasing access to healthcare for all citizens regardless of ability to pay. PHC4 has provided data to this entity in an effort to further PHC4's mission of educating the public and containing health care costs in Pennsylvania.

PHC4, its agents, and staff, have made no representation, guarantee, or warranty, expressed or implied, that the data -- financial, patient, payor, and physician specific information -- provided to this entity, are error-free, or that the use of the data will avoid differences of opinion or interpretation. This analysis was not prepared by PHC4. This analysis was done by MACP. PHC4, its agents and staff, bear no responsibility or liability for the results of the analysis, which are solely the opinion of MACP."

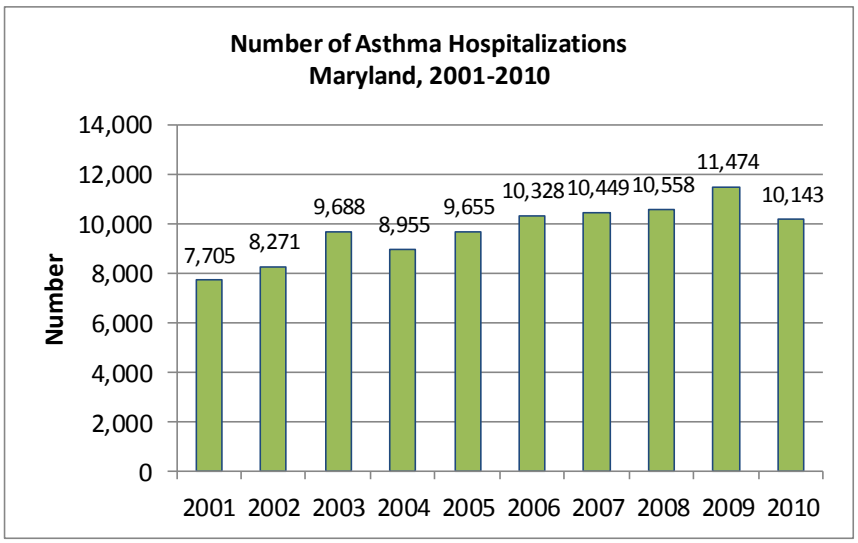
† Reports prior to 2002 presented hospitalization data determined by admission date. Since 2003, hospitalization data has been determined by discharge date. Additionally, instead of creating zip code-specific county data, county-specific data already provided by HSCRC has been used since 2006. Focusing on the county-specific data is viewed to be more accurate since many of the zip codes belong to more than one county.

HOSPITALIZATIONS - Continued

All data in this Hospitalizations Section includes Maryland residents hospitalized in Maryland, Washington D.C., Delaware, and Pennsylvania. In Figure 11-1, the number of hospitalizations is displayed by year. The 2010 total number of hospitalizations in Maryland includes the 627 Maryland residents that were hospitalized for asthma in neighboring states - 573 in Washington D.C., 34 in Delaware, and 20 in Pennsylvania.

Figure 11-1

There were approximately 10,143 hospitalizations of Maryland residents with a principal diagnosis of asthma in 2010.



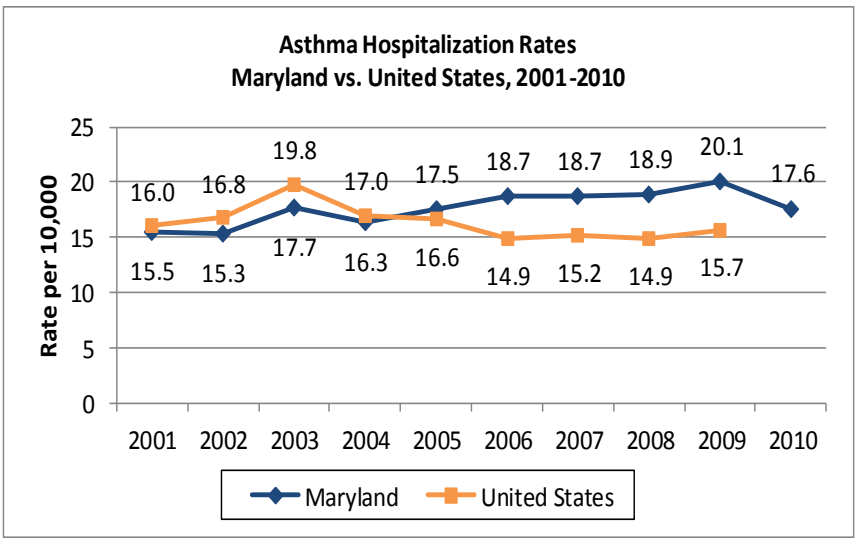
Maryland HSCRC, Maryland Health Care Commission (MHCC), Delaware Department of Health, Pennsylvania HCCCC, 2001-2010.
[a] Includes Maryland residents hospitalized in DE, PA, and Washington DC.

Figure 11-2

In 2010, the hospitalization rate for Maryland residents was 17.6 (per 10,000 population).

Asthma hospitalizations in Maryland have increased almost 13.5% from 2001 to 2010.

Maryland asthma hospitalization rates were lower than the United States until 2005. Since then, Maryland's rates have continually remained higher than the nation.

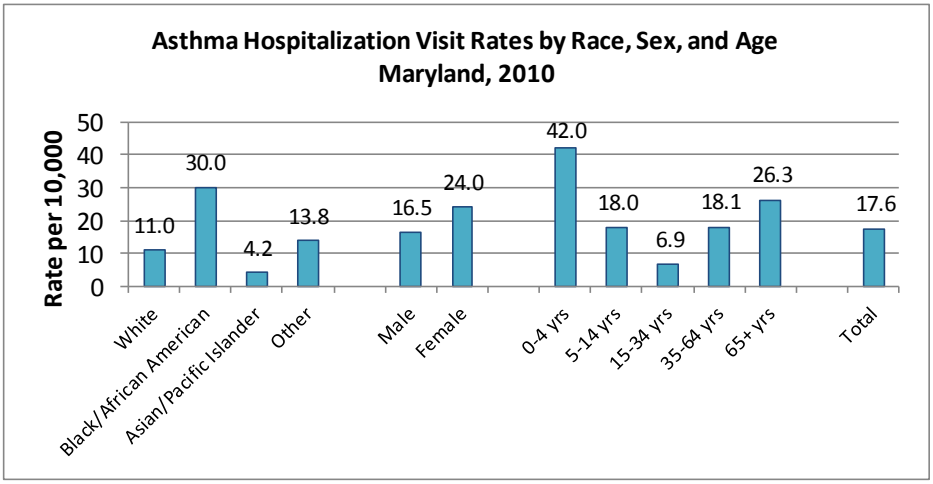


Maryland HSCRC, MHCC, Delaware Department of Health, Pennsylvania HCCCC, 2001-2010.
[a] Rates are age-adjusted to the 2010 U.S. standard population.
[b] Includes Maryland residents hospitalized in DE, PA, and Washington DC.

HOSPITALIZATIONS - Continued

In 2010, hospitalization rates for non-Hispanic Blacks were 2.7 times higher than Whites. Females continued to have higher hospitalization rates than males. Children under the age of 5 years of age continued to have the highest hospitalization rates when compared to other age groups (48.1 hospitalizations per 10,000 population).

Figure 11-3



Maryland HSCRC, Delaware Department of Health; Pennsylvania Health Care Cost Containment Council, 2010.

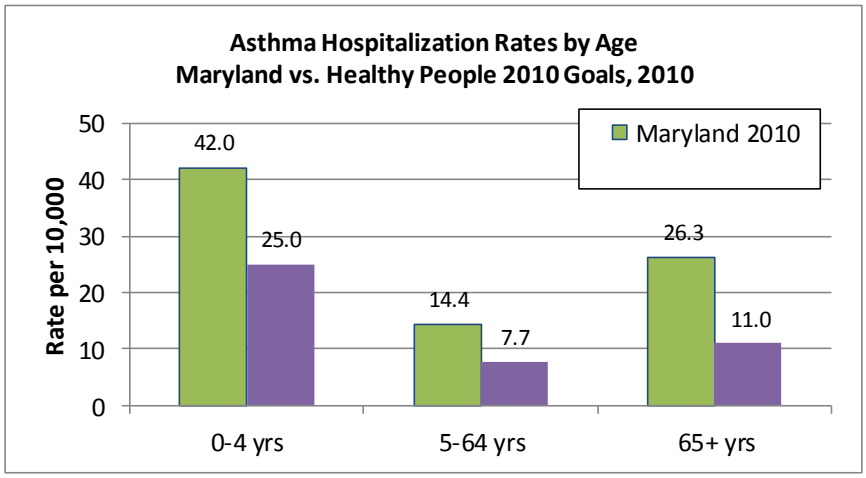
[a] Rates are age-adjusted to the 2010 U.S. standard population.

[b] Includes Maryland residents hospitalized in DE, PA, and Washington DC.

Maryland residents hospitalized for asthma spent a total of 31,582 days in the hospital during 2010, with an average stay of 3.3 days. Females and Whites had a longer average hospital stay than their counterparts. The length of hospitalization stays increased with age. Children under 5 years old spent an average of 1.7 days in the hospital, while adults aged 65 years and older spent, on average, 4.3 days in the hospital for asthma (Maryland HSCRC, 2010; out of state hospitalizations not included).

Hospitalization rates for all age groups continued to exceed Healthy People 2010 goals.[19]

Figure 11-4



Maryland HSCRC, Delaware Department of Health; Pennsylvania Health Care Cost Containment Council, 2010; DATA2010 Healthy People 2010 Database, U.S. Department of Health and Human Services, 2010.

[a] Rates are age-adjusted to the 2010 U.S. standard population.

[b] Includes Maryland residents hospitalized in DE, PA, and Washington DC.

MEDICAID ENROLLEES AND PERSISTENT ASTHMA

Medicaid is a joint federal/state funded program that provides health care coverage to low income children and adults. Maryland residents enrolled in Medicaid are served by Medicaid's managed care and fee-for-service (FFS) programs. The majority of Medicaid enrollees are enrolled in HealthChoice, Maryland Medicaid's Managed Care Program, while the FFS population is largely composed of institutionalized individuals and those eligible for Medicare. Both HealthChoice and Medicaid FFS programs provide preventive and primary care, inpatient care, benefits, as well as a variety of specialty health services. The Maryland Medicaid programs collect claims and encounter data for a variety of purposes including program administration and evaluation, and managed care organization rate-setting.

The Maryland Asthma Control Program (MACP) retrospectively examined persistent asthma in children enrolled in Maryland Medicaid and Maryland Children's Health Program (MCHP). Paid fee-for-service claims and HealthChoice encounters were obtained from Maryland Medicaid administrative dataset. These data are not representative of the general population, but serve as a proxy for asthma morbidity among the lowest income Maryland residents. Children 0 to 20 years old were included in this analysis based on the Medicaid eligibility age range for children in Maryland. As defined by the Healthcare Effectiveness Data and Information Set (HEDIS)[1], enrollees were classified as having persistent asthma based on fulfilling at least one of the four criteria during the past year: 1) at least one emergency department visit for asthma (International Classification of Diseases, ninth revision, code 493.xx) as a principal diagnosis; 2) at least one hospitalization for asthma as a principal diagnosis; 3) at least four outpatient visits for asthma as a principal diagnosis and at least two asthma medication-dispensing events; 4) at least four asthma medication-dispensing events.

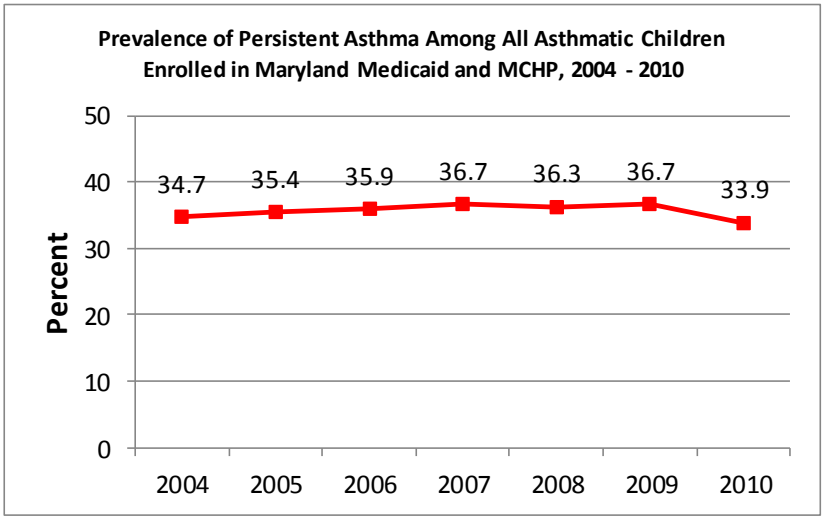
Asthma Prevalence in Persistent Asthmatics

In 2010, there were 29,932 persistent asthmatic children enrolled in Maryland Medicaid and MCHP (41% female, 59% male). The prevalence of persistent asthma among all children in Medicaid was 5.6% in 2010.

On average, there were 26,642 persistent asthmatic children enrolled in Maryland Medicaid and MCHP per year from 2004 to 2010. Of these, an average of 40.6% were female and 59.4% were male. An average of 60.6% were Black, 24.3% were White, and 15.1% were Asian, Hispanic, Native American, or Pacific Islander/ Alaskan.

A Cochran-Armitage trend test showed a significant difference in the prevalence of persistent asthma for these children from 2004 to 2010 ($p < 0.0001$). There was an increase in the prevalence of persistent asthma from 2004 to 2009, then the prevalence decreased in 2010.

Figure 12-1



Maryland Medicaid, 2004-2010.

[1] Although HEDIS criteria defines persistent asthma for ages 5 years and older, MACP included 0 to 4 year olds in this analysis since this age group of children has particularly poor outcomes based on statewide surveillance data and pre-analysis of the Medicaid data.

MEDICAID ENROLLEES AND PERSISTENT ASTHMA - Continued

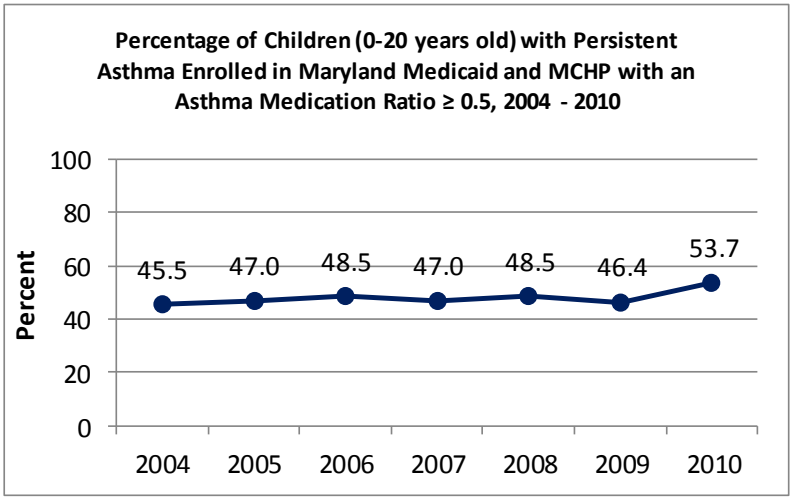
Controller-to-Total Medication Ratio in Persistent Asthmatic Children Enrolled in Medicaid/MCHP

The controller-to-total asthma medication ratio is a measure to determine quality of care in persistent asthmatics. Having a controller-to-total asthma medication ratio of 0.5 or greater is considered to be the standard quality of care.

In 2010, 53.7% of persistent asthmatic children enrolled in Maryland Medicaid and MCHP had a 0.5 or greater controller-to-total asthma medication ratio.

A Cochran-Armitage test showed a statistically significant, increasing trend in the percentage of persistent asthmatic children with a 0.5 or greater controller-to-total asthma medication ratio from 2004 to 2010 ($p < 0.0001$). The trend of an increase in persistent asthmatics with a higher controller-to-total asthma medication ratio may indicate improved quality of care of persistent asthmatic children enrolled in Maryland Medicaid and MCHP.

Figure 12-2



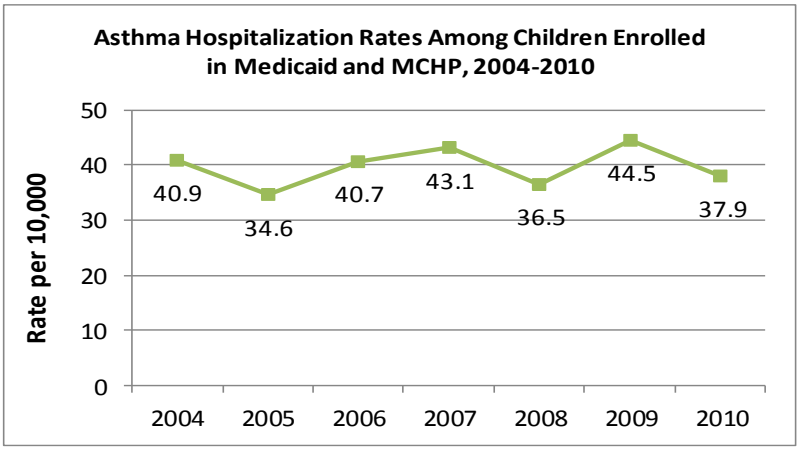
Maryland Medicaid, 2004-2010.

Hospitalization Rate of All Asthmatic Children Enrolled in Maryland Medicaid/MCHP

In 2010, the rate of hospitalizations for ***all*** asthmatic children enrolled in Maryland Medicaid and MCHP was 37.9 (per 10,000) in 2010.

A Cochran-Armitage test showed a no statistically significant trends in the rate of asthma hospitalizations in Medicaid/MCHP children from 2004 to 2010 ($p = 0.1068$).

Figure 12-3



Maryland Medicaid, 2004-2010.

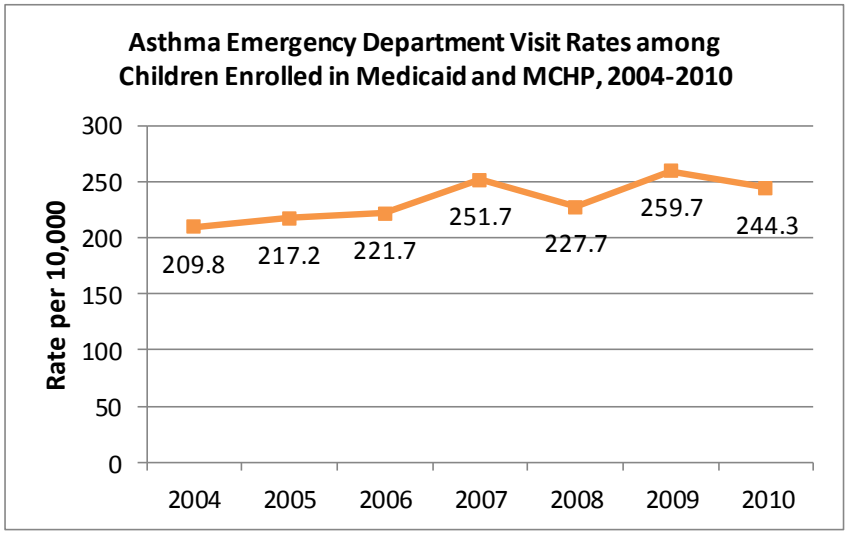
MEDICAID ENROLLEES AND PERSISTENT ASTHMA - Continued

Emergency Visit Rate of All Asthmatic Children Enrolled in Maryland Medicaid/MCHP

In 2010, the rate of emergency department visits for ***all*** asthmatic children enrolled in Maryland Medicaid and MCHP was 244.3 (per 10,000) in 2010.

A Cochran-Armitage test showed a statistically significant trend in the rate of asthma ED visits in Medicaid/MCHP children from 2004 to 2010 ($p < 0.0001$). The trend appears to be increasing.

Figure 12-4



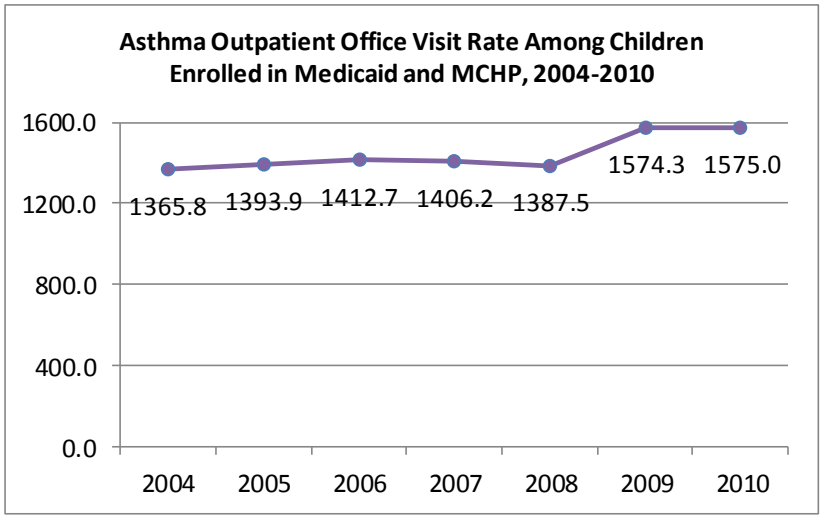
Maryland Medicaid, 2004-2010.

Office Visit Rate of All Asthmatic Children Enrolled in Maryland Medicaid/MCHP

In 2010, the rate of asthma outpatient office visits for ***all*** asthmatic children enrolled in Maryland Medicaid and MCHP was 1575.0 (per 10,000) in 2010.

A Cochran-Armitage test showed a statistically significant, increasing trend in the rate of asthma outpatient office visits in Medicaid/ MCHP asthmatic children from 2004 to 2010 ($p < 0.0001$).

Figure 12-5



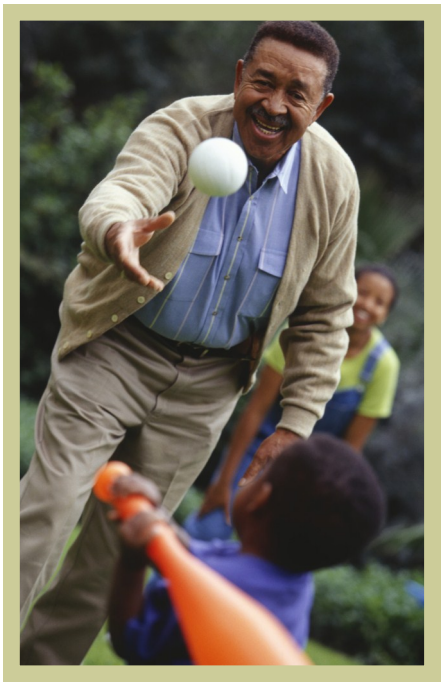
Maryland Medicaid, 2004-2010.

MORTALITY

Mortality from asthma is potentially preventable. Therefore, to some extent, trends in asthma mortality reflect the State's overall success in the management and control of asthma. The Maryland Asthma Control Program tracks asthma mortality with data from the Maryland Vital Statistics Administration (VSA). Until 1998, asthma deaths were defined as having a primary cause of death with ICD-9-CM codes of 493.0-493.9. Since 1999, asthma deaths were defined as having a primary or underlying cause of death with ICD-10 codes of J45 to J46.

Underlying cause refers to the first listed cause of death, that is, the disease or injury that initiated the chain of events leading directly to death. Contributing cause refers to all other listed causes of death, that is, significant conditions that may have contributed to the death. Unless otherwise stated, information reported here is for deaths among Maryland residents with asthma listed as the underlying cause of death. Some limited information is provided for those deaths with asthma listed as the contributing cause of death. These data included deaths of Maryland residents that occurred in Maryland. Data from 1989-2010 also include out-of-state deaths of Maryland residents. Mortality rates have been age-adjusted to the 2010 U.S. standard population.

Five-year averages are calculated for mortality rates for race, sex, and age group due to the small numbers of deaths each year. Additionally, mortality rates that contain low counts (deaths) in the numerator are not displayed to prevent any possibility of individual identification.

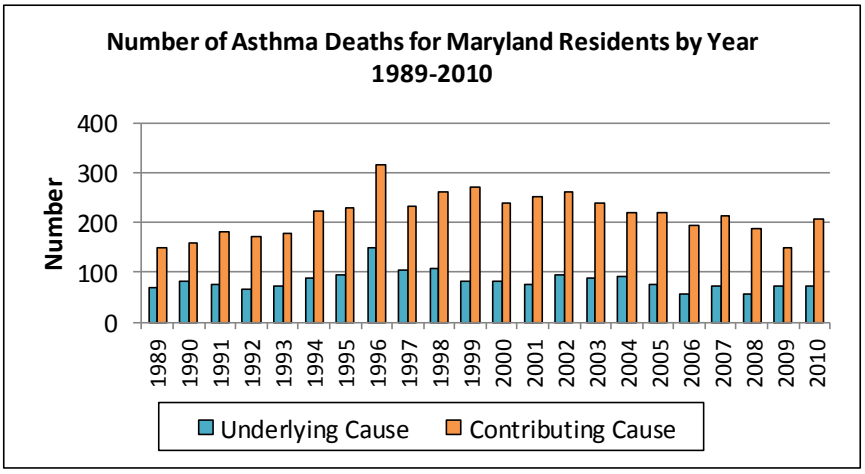


MORTALITY - Continued

Figure and Table 12.1 display the number of asthma deaths among Maryland residents from 1989 to 2010.

In 2010, 72 Maryland residents died from asthma as the underlying cause of death. Asthma contributed to the death of an additional 134 Maryland residents.

Figure 13-1



Maryland VSA, 1989-2010.

Table 13-1: Asthma Deaths Among Maryland Residents, 1989-2010

Year	Number of Deaths, Asthma as Underlying Cause	Number of Deaths, Asthma as Underlying or Contributing Cause
1989	70	148
1990	82	160
1991	76	182
1992	65	171
1993	73	178
1994	88	223
1995	96	229
1996	150	315
1997	103	232
1998	107	260
1999	81	270
2000	81	240
2001	74	253
2002	96	261
2003	87	239
2004	91	221
2005	77	220
2006	55	193
2007	73	213
2008	56	188
2009	72	221
2010	72	206

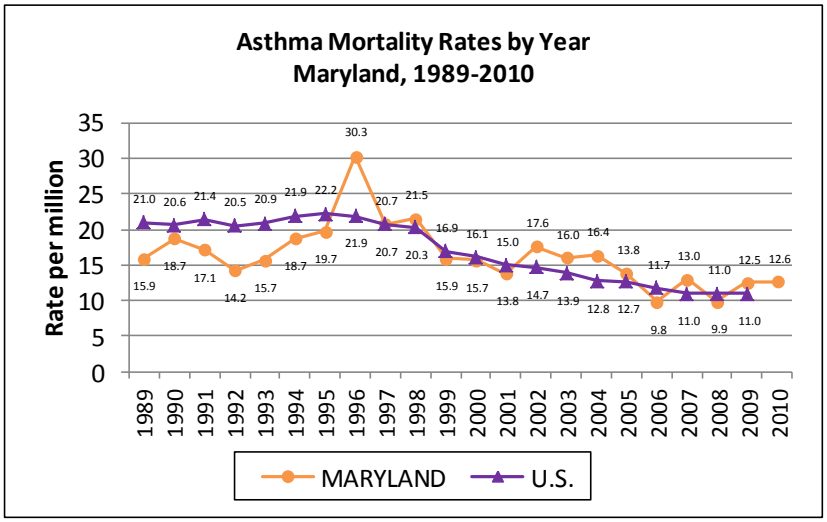
Maryland VSA, 1989-2010.

MORTALITY - Continued

Mortality rates for Maryland have remained similar to national rates over time. Both Maryland and national mortality rates appear to be on a downward trend since 1996. Over the past five years, there has been no specific trend in deaths by month or season.

The age adjusted mortality rate in Maryland for 2010 was 12.6 deaths per million.

Figure 13-2

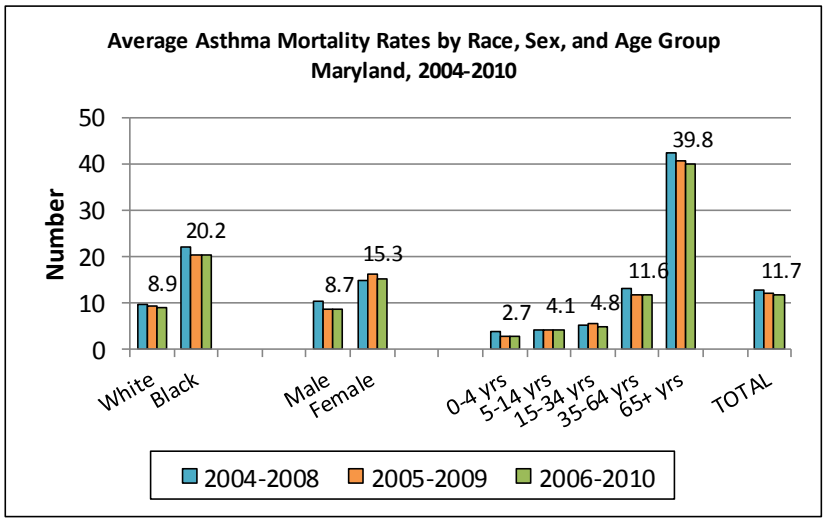


Maryland VSA, 1985-2010.
[a] Rates are age-adjusted to the 2010 U.S. standard population.

From 2006-2010, an average of 65.6 Maryland residents died each year from asthma as an underlying cause; a rate of 11.7 deaths per million.

Disparities in asthma mortality continue to exist - Blacks continue to die at a rate over twice as high than that of Whites (2006-2010 mortality rate of 20.2 vs. 8.9 per million). Women have a higher mortality rate than men (2006-2010 mortality rate of 15.3 vs. 8.7 per million). Asthma mortality rates are highest in the elderly and lowest in children under 5 years of age (2006-2010 mortality rate of 39.8 vs. 2.7 per million).

Figure 13-3

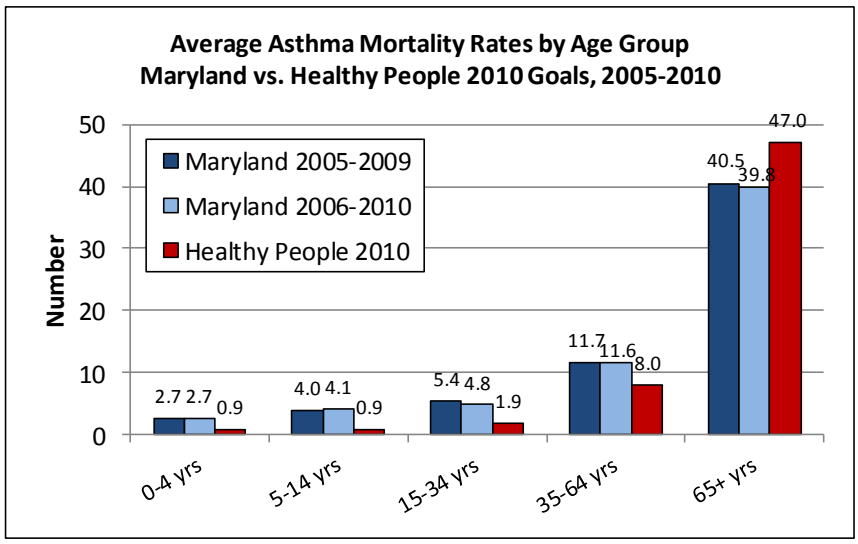


Maryland VSA, 1985-2010.
[a] Rates are age-adjusted to the 2010 U.S. standard population.

MORTALITY - Continued

Maryland asthma mortality rates over the past 5 years have exceeded Healthy People 2010 goals for all age groups except for persons 65 years and older.[19]

Figure 13-4



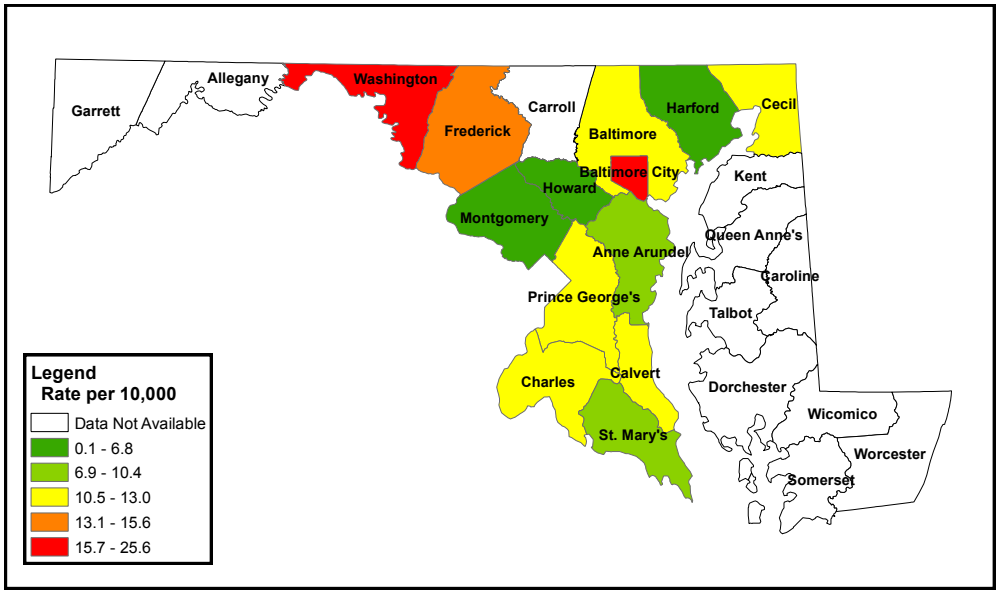
Maryland VSA, 2005-2010; DATA2010 Healthy People 2010 Database, U.S. Department of Health and Human Services, 2010.

[a] Rates are age-adjusted to the 2010 U.S. standard population.

Figure 13-5: Maryland Average Annual Asthma Mortality Rates by Jurisdiction, 2006-2010

Baltimore City (25.6), Washington (20.8), and Frederick (15.6) all had significantly higher asthma mortality rates compared to Maryland's state asthma mortality rate of 11.7 per million in 2010.

See Table 15.1 and 15.2 on page 43 and 44 for each specific jurisdiction's average annual mortality rates.



Maryland VSA, 2006-2010.

[a] Rates are age-adjusted to the 2010 U.S. standard population.

[b] Jurisdictions with low data counts are not available for display.

The Maryland Asthma Control Program will continue to follow mortality rates to determine whether current trends in asthma mortality persist. Specific circumstances surrounding asthma deaths will also be followed to better identify and address the risk factors that may lead to fatal asthma events.

DISPARITIES AND ASTHMA

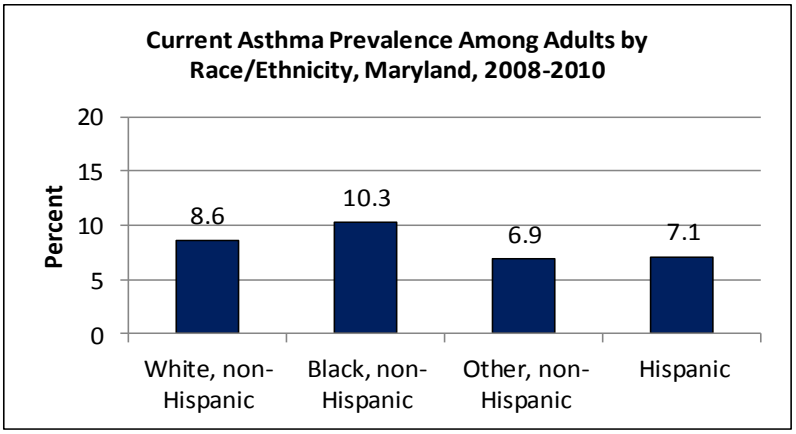
Data from the previous sections demonstrate the existence of many disparities in asthma morbidity and mortality. Black children have a higher asthma prevalence than White children in Maryland. Adult women in Maryland are more likely to have asthma than men. Additionally, persons with low income and lower levels of education are disproportionately burdened by asthma (see Figures 1.6 and 1.7 on page 15). Disparities are also seen when examining rates of hospitalization and emergency department visits. When examining Maryland residents of all ages, Blacks have much higher hospitalization and emergency department visits than Whites. Young children (less than 5 years of age) have disproportionate numbers of hospitalizations and emergency department visits compared to older persons with asthma. Blacks have higher asthma mortality rates than Whites. Additionally, asthma disproportionately affects individuals living in certain jurisdictions (see next section, 'Maryland Jurisdictions and Asthma').

For some groups, increased rates of hospitalization, emergency department visit, and mortality may be a direct result of the increased prevalence of asthma in those groups. For example, if one group has twice the prevalence of asthma, that group might be expected to also have twice the rate of hospitalizations, emergency department visits, and deaths. In order to examine whether prevalence of asthma among Blacks could explain the higher morbidity and mortality, the "disparity ratio" was examined. The disparity ratio is defined as the ratio of Blacks to Whites. Figure 13-1 through 13-4 provide the rate of hospitalization, ED visits, and mortality for Blacks and Whites. The disparity ratios for these measurements are presented in Figure 13-5.

DISPARITIES AND ASTHMA - Continued

As shown in Figure 1-5 on page 14, the current asthma prevalence was significantly higher for adults who self-reported their race/ethnicity as Black, non-Hispanic (10.3%) compared to White, non-Hispanic and Other, non-Hispanic race/ethnicity categories (8.6%, 6.9%).

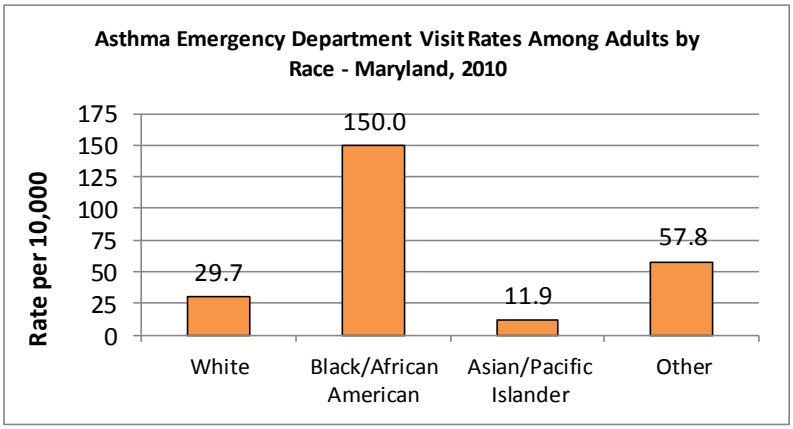
Figure 14-1



Maryland BRFSS, 2008-2010.

Black adults in Maryland had a higher rate of emergency department visits compared to Other race in adults, White adults, and Asian/Pacific Islander adults (150.0 vs. 57.8, 29.7, and 11.9 per 10,000).

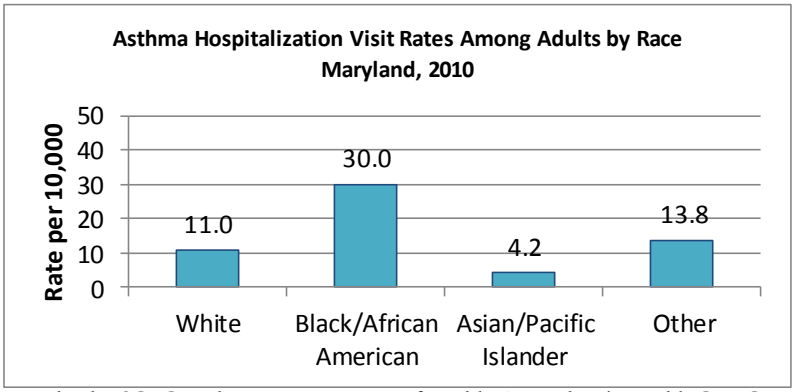
Figure 14-2



Maryland HSCRC, 2010.
Rates are age-adjusted to the 2010 U.S. standard population.

Black/African American adults in Maryland had a higher hospitalization rate than Other race adults, White adults, and Asian/Pacific islander adults (30.0 vs. 13.8, 11.0, 4.2 per 10,000).

Figure 14-3

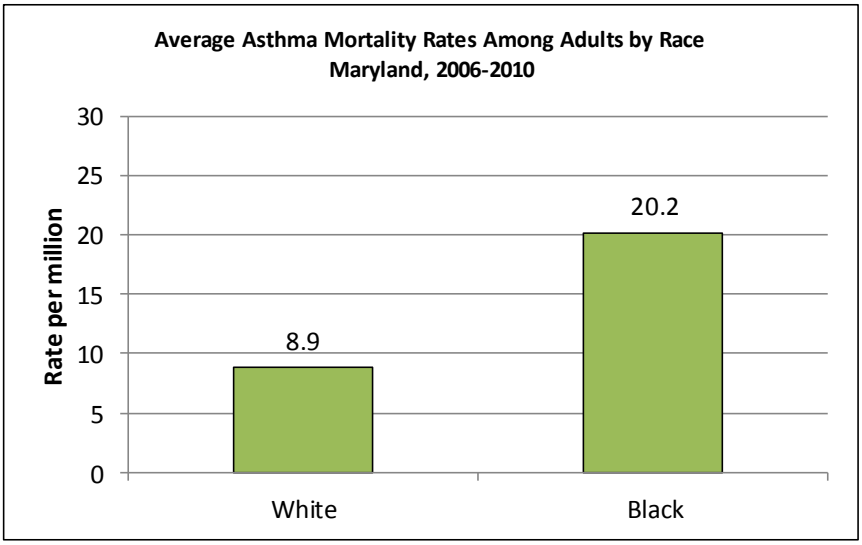


Maryland HSCRC, Delaware Department of Health; Pennsylvania Health Care Cost Containment Council, 2010.
[a] Rates are age-adjusted to the 2010 U.S. standard population.

DISPARITIES AND ASTHMA - Continued

From 2006-2010 (5-year average), Black adults in Maryland had a higher mortality rate than White adults (20.2 vs. 8.9 deaths per million).

Figure 14-4

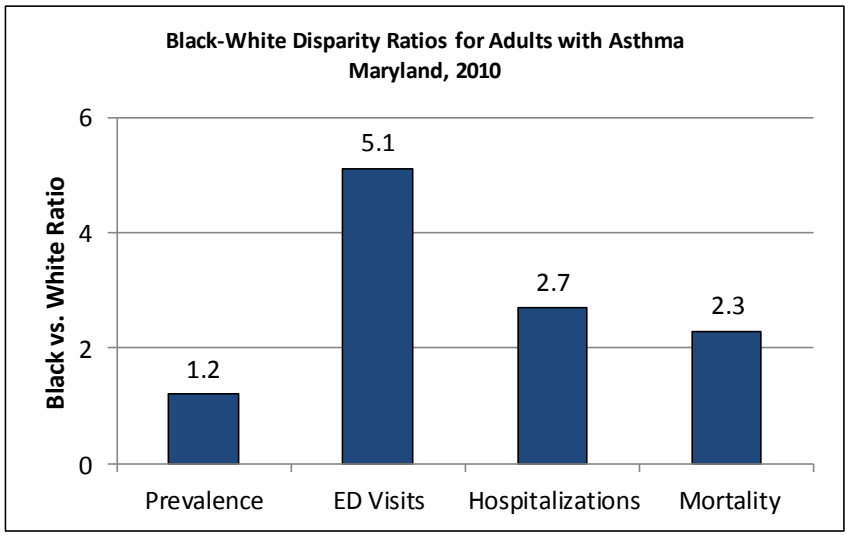


Maryland VSA, 2006-2010.
Rates are age-adjusted to the 2010 U.S. standard population.

Although Black adults in Maryland had a 1 to 1 asthma prevalence ratio to White adults (10.3% vs. 8.6%), they had significantly higher ED, hospitalization, and mortality rates.

Black adults had a 5.1 times higher rate of ED visits (150.0 vs. 29.7 visits per 10,000), a 2.7 times higher hospitalization rate (30.0 vs. 11.0 hospitalizations per 10,000), and a 2.3 times higher mortality rate (20.2 vs. 8.9 deaths per million).

Figure 14-5



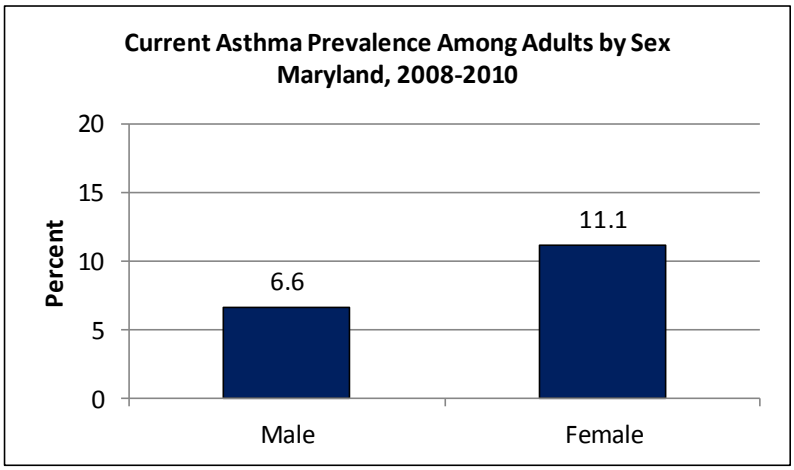
Maryland BRFSS, 2008-2010; Maryland HSCRC, 2010; Maryland VSA, 2006-2010.
[a] Rates are age-adjusted to the 2010 U.S. standard population.
[b] ED visits and hospitalizations are 2010 data, prevalence is aggregated 2008-2010 data, and mortality is aggregated 2006-2010 data.

DISPARITIES AND ASTHMA - Continued

Adult women in Maryland consistently have higher prevalence, hospitalization rates, and mortality rates when compared to men. The higher prevalence of asthma among women might be explained by physiological differences such as smaller airways, hormonal differences, or increased health care usage among women. Additionally, higher smoking rates among men may lead to more men being diagnosed with chronic obstructive pulmonary disease rather than asthma. Female-male disparity ratios for these measurements are presented in Figure 13-10.

As shown in Figure 1-4 on page 14, adult women in Maryland had a significantly higher asthma prevalence compared to adult men (11.1% vs. 6.6%).

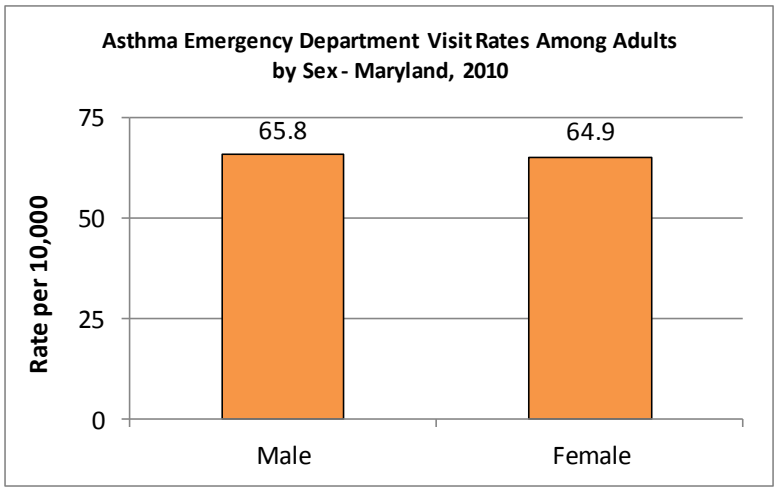
Figure 14-6



Maryland BRFSS, 2008-2010.
Rates are age-adjusted to the 2010 U.S. standard population.

Adult women in Maryland had a similar rate of emergency department visits compared to adult men (64.9% vs. 65.8%).

Figure 14-7

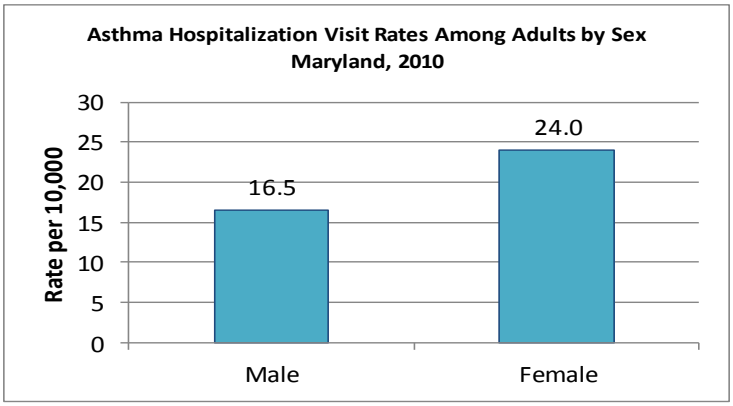


Maryland HSCRC,-2010.
Rates are age-adjusted to the 2010 U.S. standard population.

DISPARITIES AND ASTHMA - Continued

Adult women in Maryland had a higher hospitalization rate than adult men (24.0 vs. 16.5 hospitalizations per 10,000).

Figure 14-8



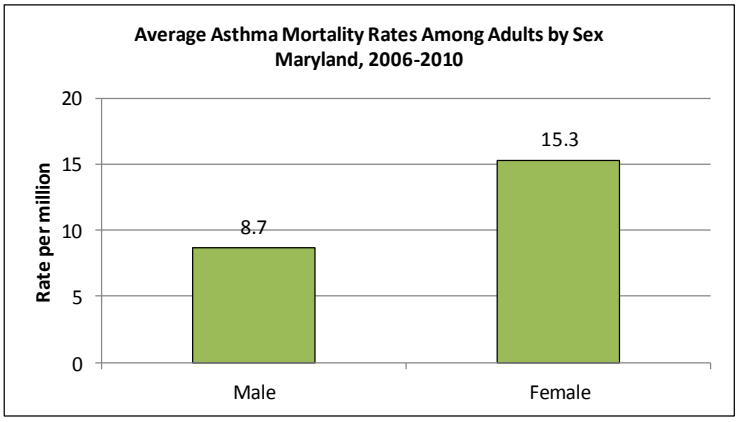
Maryland HSCRC, Delaware Department of Health; Pennsylvania Health Care Cost Containment Council, West Virginia Health Care Authority, 2010.

[a] Rates are age-adjusted to the 2010 U.S. standard population.

[b] Includes Maryland residents hospitalized in DE, PA, Washington DC, and WV.

Adult women in Maryland had a higher mortality rate than adult men (19.0 vs. 9.4 deaths per million).

Figure 14-9

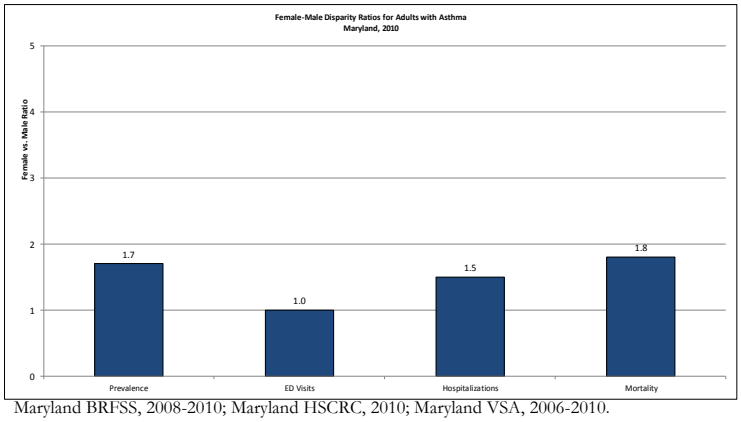


Maryland VSA, 2006-2010.

Rates are age-adjusted to the 2010 U.S. standard population.

The prevalence of asthma among women in Maryland is 1.7 times higher than that among men (11.1% vs. 6.6%). Women have a 1 to 1 ED visit ratio to men (64.9 vs. 65.8 visits per 10,000). Women have a 1.5 times higher hospitalization rate (24.0 vs. 16.5 hospitalizations per 10,000) and a 1.8 times higher mortality rate (15.3 vs. 8.7 deaths per million).

Figure 14-10



Maryland BRFSS, 2008-2010; Maryland HSCRC, 2010; Maryland VSA, 2006-2010.

[a] Rates are age-adjusted to the 2010 U.S. standard population.

[b] ED visits/hosp are 2010 data, prevalence is aggregated 2008-2010 data, mortality is aggregated 2006-2010 data.

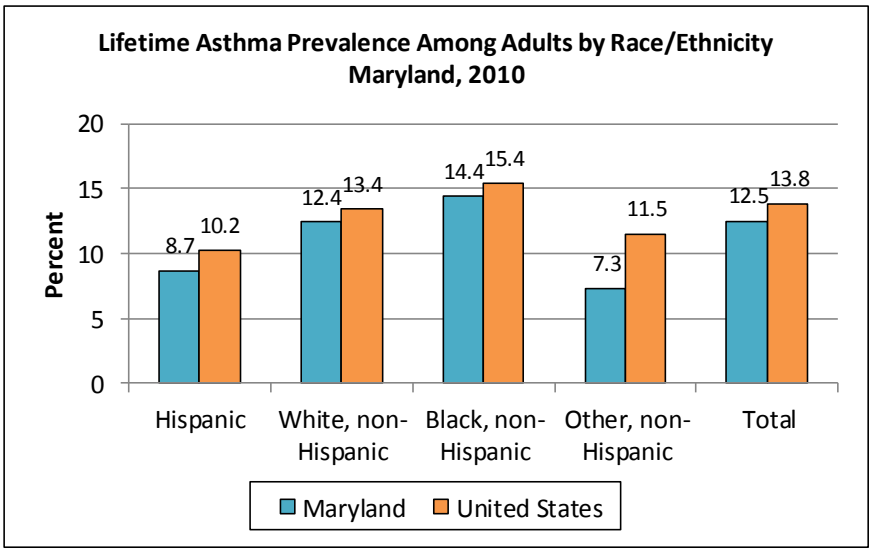
ASTHMA AMONG MARYLAND HISPANICS

Data regarding Maryland Hispanics with asthma is somewhat limited. Prevalence data is available from the BRFSS. The survey was only conducted in English until 2007, when the BRFSS began administering the survey in Spanish as well. Three-year averages are calculated since small sample sizes still persist each year.

Figure 15-1

In 2010, the lifetime asthma prevalence was not significantly lower for Hispanic adults in Maryland compared to other race groups in Maryland.

Maryland lifetime prevalence was lower than the United States for all race/ethnic groups, although the significance is unknown.

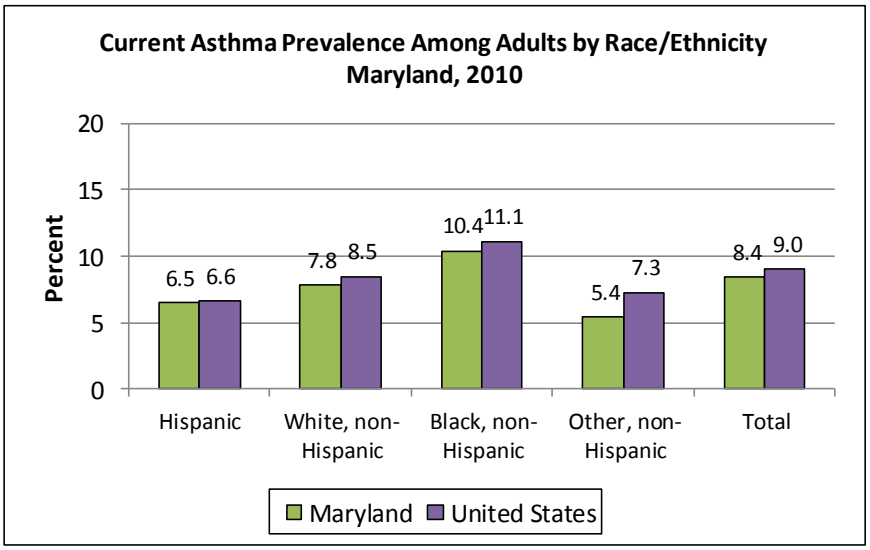


Maryland BRFSS, 2010; CDC BRFSS, 2010.

Figure 15-2

In 2010, the current asthma prevalence was not significantly lower for Hispanic adults in Maryland compared to other race groups in Maryland.

Maryland current prevalence was lower than the United States for all race/ethnic groups, although the significance is unknown.



Maryland BRFSS, 2010; CDC BRFSS, 2010.

MARYLAND JURISDICTIONS AND ASTHMA

The burden of asthma prevalence, hospitalizations, emergency department visits, and deaths differs across the state. Baltimore City residents consistently have among the highest prevalence, rates of emergency department visit, hospitalization, and death. While all Baltimore City rates are above the state average, other counties have high rates in one category, but lower rates in others. This is because multiple factors such as differences in population risk, access to primary care, access to emergency care, and quality of care may affect emergency department visit, hospitalization, and death rates.

The BRFSS is used to generate jurisdiction-level prevalence estimates. Sample sizes for each jurisdiction are relatively small per year, but a greater stability of the estimates is obtained when years are combined. Based on the small sample sizes of asthma data for children by jurisdiction, the BRFSS data in this section is for adults only. As with previous Maryland asthma surveillance reports, three years of data (2008-2010) have been combined in order to provide better estimates of prevalence. Because BRFSS prevalence data are estimates based on a sampling of the population, 95% confidence intervals have been provided to account for possible sampling fluctuations.

For mortality rates, five years of jurisdiction-specific data have been combined, as the number of asthma deaths per year in each jurisdiction is small. The 2006-2010 mortality data is presented for all Maryland residents (adults and children) in Figure 12.5 on page 42. Mortality rates that contain five or less events (deaths) in the numerator are displayed as zero to prevent any possibility individual identification. Even when several years of data are combined, there may be large changes in rates from last year's report for some low population counties. Data may still be somewhat unstable because of the small number of deaths and the low number of BRFSS respondents in these smaller counties.

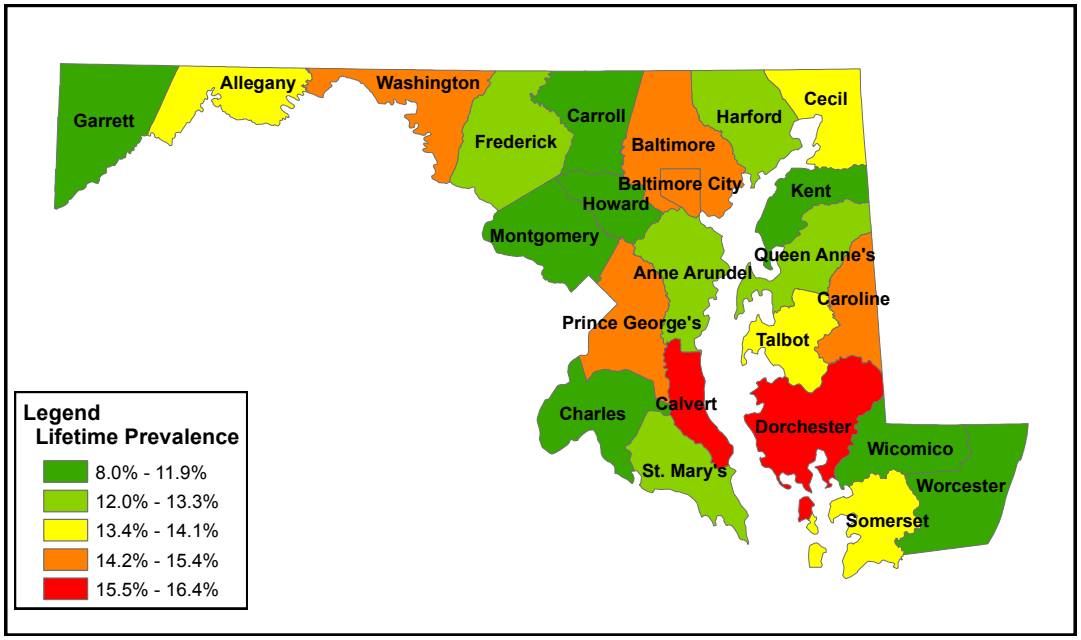
The numbers of hospitalizations and emergency department visits are much larger than those for prevalence and mortality. Therefore, data are presented for 2010 only. Adults and children are included in the hospitalization and ED visit data. For this section on jurisdictions, asthma hospitalization data includes Maryland residents hospitalized in Washington D.C. Data was not collected on emergency department visits of Maryland residents in neighboring states. Therefore, emergency department visit rates may be underestimated, particularly for those jurisdictions that border other states.

For all data in this section, percentages are weighted to the 2010 Maryland population and rates are age-adjusted to the 2010 standard U.S. population.

MARYLAND JURISDICTIONS AND ASTHMA

From 2008-2010, adults in Calvert (16.4%), Dorchester (16.2%), Baltimore City (15.4%), and Caroline (15.4%) had the highest asthma lifetime prevalence in Maryland.

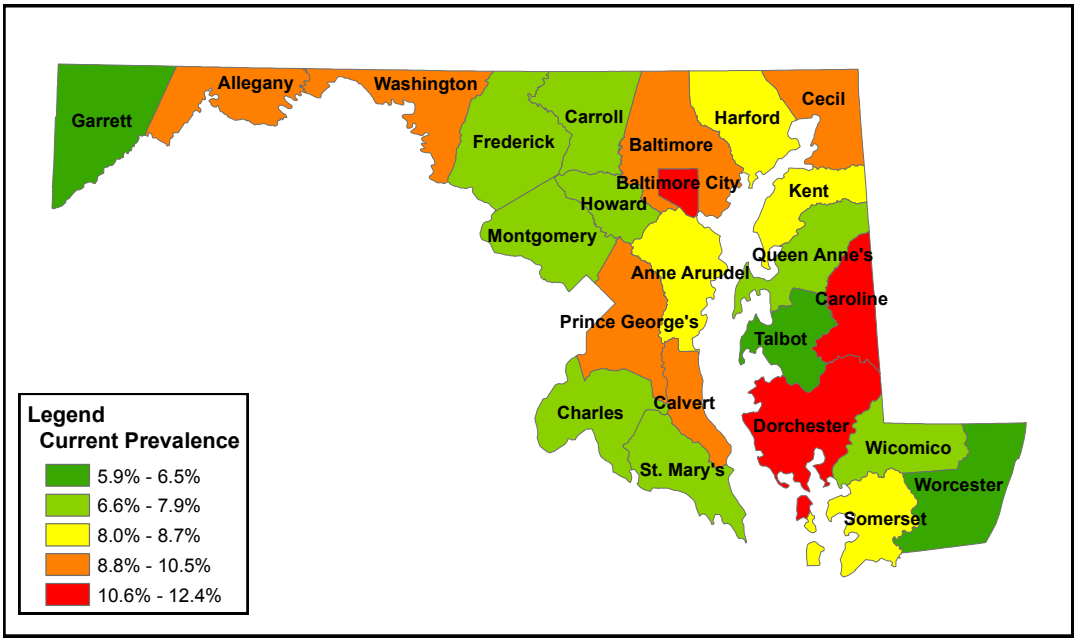
Figure 16-1: Maryland Adult Asthma Lifetime Prevalence by Jurisdiction, 2008-2010



Maryland BRFSS, 2008-2010.

From 2008-2010, adults in Baltimore City (12.4%), Dorchester (11.1%), and Caroline (11.0%) had the highest prevalence of current asthma in Maryland.

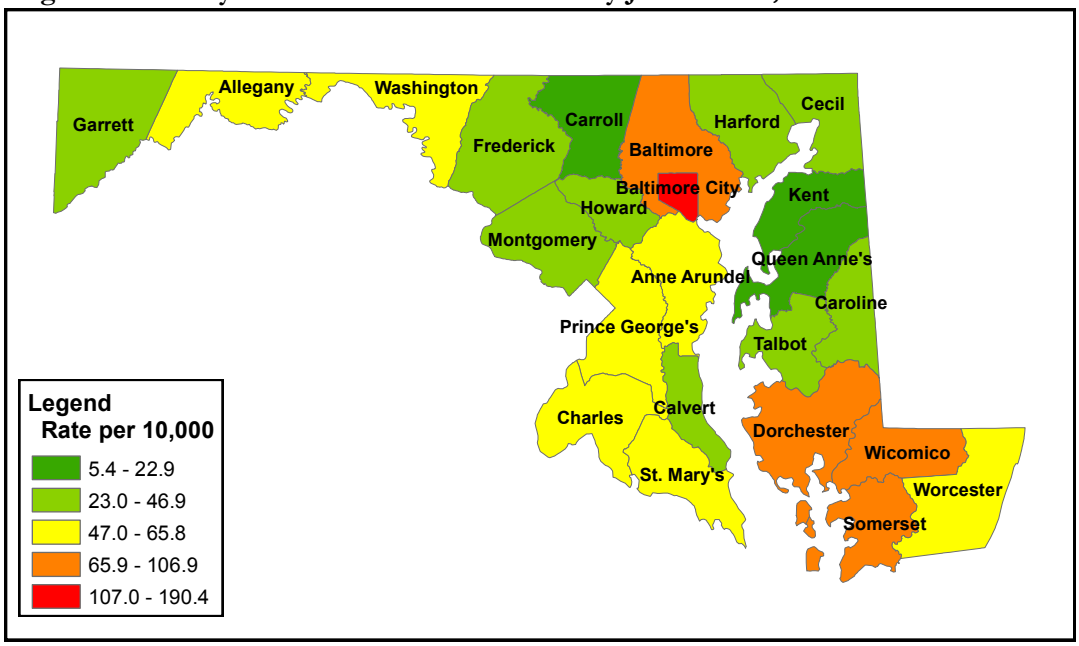
Figure 16-2: Maryland Adult Asthma Current Prevalence by Jurisdiction, 2008-2010



MARYLAND JURISDICTIONS AND ASTHMA - Continued

Baltimore City, Dorchester, Wicomico, and Somerset, all had significantly higher rates of asthma ED visits compared to Maryland's state asthma ED visit rate in 2010 (190.4, 106.9, 99.1, and 82.0 vs. 65.5 per 10,000).

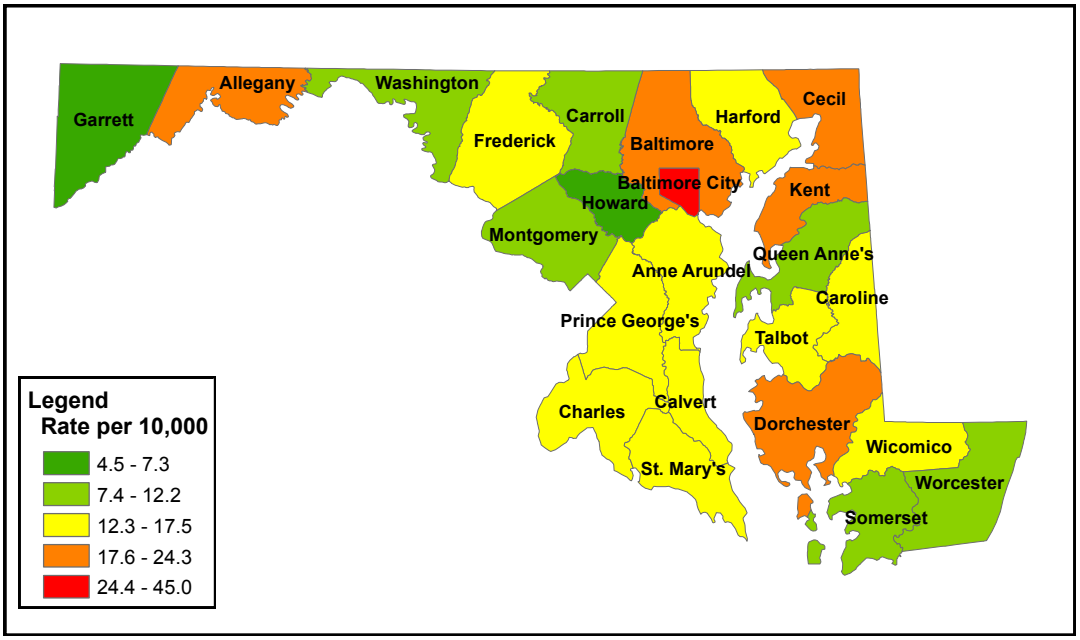
Figure 16-3: Maryland Asthma ED Visit Rates by Jurisdiction, 2010



Maryland HSCRC, 2010.
[a] Rates are age-adjusted to the 2010 U.S. standard population.

Baltimore City, Dorchester, Cecil, and Allegany all had significantly higher asthma hospitalization rates compared to Maryland's state asthma hospitalization rate in 2010 (45.0, 24.3, 21.8, and 20.8 vs. 17.6 per 10,000).

Figure 16-4: Maryland Asthma Hospitalization Rates by Jurisdiction, 2010



Maryland HSCRC, 2010; Maryland HCC, 2010.
[a] Rates are age-adjusted to the 2010 U.S. standard population.
[b] Includes Maryland residents hospitalized in Washington D.C.

MARYLAND JURISDICTIONS AND ASTHMA

Table 16-1: Average Lifetime and Current Asthma Prevalence in Adults, 2008-2010; ED and Hospitalization Rates, 2010; Average Mortality Rates, 2006-2010. Data by Region and Jurisdiction.
****Rate significantly different from state of Maryland rate ($p < 0.05$).**

Jurisdiction	Average Lifetime Prevalence in Adults Weighted Percent (95% CI)	Average Current Prevalence in Adults Weighted Percent (95% CI)	ED Visit Rates (per 10,000)	Hospitalization Rates (per 10,000)	Average Mortality Rates (per 1 million)
NORTHWEST			43.0	13.8 **	15.0 **
Garrett	10.9 (8.0-13.8)	6.2 (4.0-8.5)	33.9	4.5 **	--
Allegany	13.8 (10.9-16.7)	9.7 (7.2-12.2)	52.8	20.8 **	--
Washington	15.1 (12.6-17.6)	10.4 (8.3-12.5)	58.2	10.3 **	20.8 **
Frederick	12.9 (11.0-14.9)	7.4 (5.9-8.9)	31.5	14.7	15.6 **
BALTIMORE METRO			88.5 **	22.1 **	13.1
Baltimore City	15.4 (13.3-17.5)	12.4 (10.5-14.4)	190.4 **	45.0 **	25.6 **
Baltimore County	15.3 (13.7-16.9)	10.5 (9.2-11.8)	75.6	19.1	12.5
Anne Arundel	13.2 (11.3-15.1)	8.7 (7.1-10.3)	57.1	15.7	9.0 **
Carroll	11.8 (8.7-14.9)	7.4 (4.9-9.9)	22.9	12.3 **	--
Howard	11.8 (9.4-14.2)	7.9 (5.9-9.9)	40.1	7.3 **	5.0 **
Harford	12.5 (9.8-15.3)	8.6 (6.3-10.9)	46.9	15.7	5.8 **
NATIONAL CAPITOL			42.5	12.9 **	9.8
Montgomery	11.9 (10.5-13.3)	7.2 (6.1-8.3)	30.3	9.5 **	6.8 **
Prince George's	14.7 (12.9-16.5)	9.4 (7.9-10.9)	56.1	17.2	13.0
SOUTHERN MD			53.1	14.7	11.7
Calvert	16.4 (13.1-19.7)	10.2 (7.5-12.9)	44.5	13.2 **	12.8
Charles	11.1 (8.7-13.5)	7.1 (5.1-9.1)	59.3	16.5	12.2
St. Mary's	13.3 (10.5-16.1)	7.8 (5.6-10.0)	51.9	13.6 **	10.4
EASTERN SHORE			60.2	16.4	5.5 **
Cecil	13.8 (10.9-16.8)	9.4 (6.9-11.9)	40.7	21.9 **	12.7
Kent	10.7 (7.3-14.1)	8.1 (5.1-11.1)	5.4 **	20.3	--
Queen Anne's	13.0 (10.3-15.7)	7.5 (5.4-9.7)	19.4	9.7 **	--
Caroline	15.4 (11.7-19.1)	11.0 (7.8-14.2)	43.7	14.1 **	--
Talbot	13.5 (10.5-16.5)	6.5 (4.4-8.7)	45.5	16.9	--
Dorchester	16.2 (12.6-19.8)	11.1 (8.0-14.2)	106.9 **	24.3 **	--
Wicomico	10.7 (8.1-13.3)	7.6 (5.4-9.8)	99.1 **	17.5	--
Somerset	14.1 (9.8-18.5)	8.6 (5.1-12.1)	82.0 **	10.3 **	--
Worcester	8.0 (5.2-10.8)	5.9 (3.4-8.4)	65.8	10.2 **	--
TOTAL	13.5 (13.0-14.0)	9.0 (8.6-9.4)	65.5	17.6	11.7

Maryland BRFSS, 2008-2010; Maryland HSCRC, 2010; Maryland HCC, 2010; Maryland VSA, 2006-2010; Pennsylvania HCCCC, 2010.
[a] Hospitalization and ED visit rates are age-adjusted to the 2010 U.S. standard population.
[b] Hospitalization data includes Maryland residents hospitalized in Pennsylvania and Washington D.C.

MARYLAND JURISDICTIONS AND ASTHMA - Continued

Table 16-2: Total Number of Adults with Lifetime and Current Asthma Prevalence, 2008-2010 (average); Total Number of ED Visits and Hospitalizations, 2010; Total Number of Deaths per Year, 2006-2010 (average). Data by Region and Jurisdiction.

Jurisdiction	Total Number of Adults with Lifetime Asthma	Total Number of Adults with Current Asthma	Total Number of ED Visits	Total Number of Hospitalizations[a]	Total Number of Deaths per Year
NORTHWEST			2,021	680	7.2
Garrett	3,135	1,790	91	15	--
Allegany	9,112	6,319	365	173	--
Washington	16,481	11,401	832	152	3.2
Frederick	21,236	12,166	733	340	3.0
BALTIMORE METRO			23,230	5,854	34.2
Baltimore City	60,748	48,583	11,743	2,685	15.8
Baltimore County	101,353	69,387	5,804	1,529	10.4
Anne Arundel	49,901	36,197	3,054	847	4.6
Carroll	16,195	10,115	367	208	--
Howard	28,766	19,187	1,144	199	1.2
Harford	23,004	15,743	1,118	386	1.4
NATIONAL CAPITOL			7,836	485	16.4
Montgomery	86,692	51,798	2,907	918	6.2
Prince George's	89,348	56,591	4,929	1,403	10.2
SOUTHERN MD			1,838	487	3.4
Calvert	11,152	6,867	379	117	1.0
Charles	11,866	7,651	894	229	1.4
Saint Mary's	11,197	6,491	565	141	1.0
EASTERN SHORE			2,557	761	4.4
Cecil	9,777	6,589	406	222	1.2
Kent	2,017	1,516	10	44	--
Queen Anne's	4,900	2,804	85	49	--
Caroline	4,155	2,974	143	48	--
Talbot	3,695	1,758	144	70	--
Dorchester	3,579	2,438	315	82	--
Wicomico	7,662	5,420	963	167	--
Somerset	2,272	1,376	202	28	--
Worcester	3,391	2,476	289	51	--
TOTAL	581,635	384,211	37,523[b]	9,516[b]	65.6[b]

Maryland BRFSS, 2008-2010; Maryland HSCRC, 2010; Maryland HCC, 2010; Maryland VSA, 2006-2010; Pennsylvania HCCCC, 2010.

[a] Hospitalization data includes Maryland residents hospitalized in Pennsylvania and Washington D.C.

[b] Total includes events that did not have a Maryland jurisdiction listed.

CONCLUSIONS

This report confirms that asthma continues to be a major public health problem in Maryland. An estimated 12.4% of Maryland adults and 16.4% of Maryland children have been diagnosed with asthma. An estimated 8.4% of adults and 11.9% of children in Maryland currently have asthma. Over the past decade, these prevalence rates have been steadily increasing.

The 2008-2010 Maryland Asthma Call-back Survey assessed asthma control and management, asthma self-management education, and environmental triggers in the homes of children and adults with asthma. These data indicate that there is room to improve asthma control among Marylanders with asthma, as exemplified by the 29.9% of adults who were unable to work for at least one day during the past year due to asthma and the 24.6% of school-aged children who missed at least three or more school days during the past year due to asthma. In addition, the 2008-2010 Maryland Asthma Call-back Survey also provides a first look at the prevalence of work-related asthma and comorbid chronic conditions among Maryland adults who have asthma. Approximately 6.9% of adults with asthma reported having been told that their asthma was work-related. Approximately one-third of adults with asthma report a diagnosis of depression. Over one-third of adults with asthma reported a diagnosis of some form of COPD (chronic bronchitis, COPD, and/or emphysema).

Over the past decade, hospitalization rates for asthma have steadily increased in Maryland. Mortality rates for asthma have slowly declined over the past two decades. Asthma prevalence, hospitalization rates, emergency department visit rates, and mortality rates still remain well above the Healthy People 2010 goals (with the exception Maryland adults ages 65 years and older who met the Healthy People 2010 goal for emergency department visit and mortality rates).

As indicated in the section on disparities, asthma and its complications continue to disproportionately affect very young children, older adults, Blacks, women, low-income individuals, individuals with lower levels of education, and individuals in certain jurisdictions, particularly Baltimore City. The monetary cost of asthma hospitalizations and emergency department visits is substantial and is largely borne by public insurers, Medicare and Medicaid. Additional tracking of asthma prevalence, morbidity, and mortality is vital to improve understanding of individual and environmental contributing factors. Information gained from analyzing the epidemiology of asthma is critical to planning, implementing, and evaluating activities aimed at reducing the personal and public health burden of asthma for Maryland residents. Since interventions to reduce the burden of asthma take time to have an effect on data indicators, the effectiveness of asthma control programs and reductions in the burden of asthma will continue to be tracked by ongoing surveillance activities.

FUTURE DIRECTIONS

The Maryland Asthma Control Program (MACP) will continue to produce ongoing asthma surveillance reports and data briefs. Findings from new datasets and/or enhanced statistical analysis will be included in future reports. Data is collected annually to assess the burden of asthma among the privately insured population as well as Marylanders in school, child care, and workplace settings. MACP will continue its ongoing evaluation of the surveillance system to ensure its effectiveness.

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GLOSSARY OF TERMS

Age-adjustment – A statistical process applied to rates of death, hospitalizations, disease, or other health outcomes which allows populations with different age distributions to be compared (see Appendix B).

Asthma – A controllable chronic lung disease characterized by inflammation of the airways that leads to reversible airway constriction and excess mucus secretion. This narrowing of the airway results in reduced airflow that may cause symptoms of wheezing, coughing, tightness of the chest, and difficulty breathing. Asthma affects both adults and children and is the most common chronic disease of childhood.[1]

Average Mortality Rate –

$$\frac{\text{The average number of people dying from a disease within a specified time period}}{\text{The total number of people in the population during that time period}}$$

Confidence Interval (95%) – The range in which the true magnitude of effect (e.g., prevalence) lies with a 95% degree of assurance.

When two groups have 95% confidence intervals that overlap, indicating that the "true" value could potentially be the same in both groups, the groups are conservatively assumed to have statistically similar rates. If the confidence intervals do not overlap, we assume that the groups being compared are significantly different from one another. A narrow confidence interval implies high precision; while a wide interval implies poor precision. Determination of statistical significance for data in this report is based on non-overlapping 95% confidence intervals. Although this is not strictly speaking a statistical test, it is a commonly accepted way to compare estimates.

Disparity Ratio – A measure comparing a specific group to another specific group which highlights the differences (e.g., comparing Blacks to Whites or females to males).

Contributing Cause – The term used to describe all other listed causes of death, that is, significant conditions that may have contributed to the death.

Encounter – A visit between a patient and a health care provider.

Healthy People 2010 – A statement of national health objectives designed to identify the most significant preventable threats to health and establishes national goals to reduce these threats. The main goals are to increase quality and years of healthy life and to eliminate health disparities. http://www.healthypeople.gov

ICD-9 – International Classification of Diseases, 9th revision; a numbered system of classifying diseases and health conditions that is published by the World Health Organization (WHO) and used as an international standard for epidemiological and health management purposes.

ICD-10 – International Classification of Diseases, 10th revision; published in 1990 as an updated version of ICD-9 (See also "ICD-9"). This term is used to classify the causes of death due to diseases or health conditions.

GLOSSARY OF TERMS - Continued

Morbidity – General term used to refer to the range of negative outcomes due to the presence and/or severity of a disease or health in question.

Mortality – General term used to refer to death due to the disease or condition.

Prevalence – The proportion of people in a population that have a disease or condition at a given point in time.

Current Prevalence – The proportion of people in a population that currently has a disease or condition at a given point of time.

Lifetime Prevalence - The proportion of people in a population who have ever had the disease or condition at a given point of time.

Principal Diagnosis – The primarily disease or condition for which the patient is admitted for care.

Rate – A measure of some event, disease, or condition in relation to a unit of population, within some specified period of time.

$$\frac{\text{Number of events in a given time period}}{\text{Number of people at risk of experiencing the event in that same time period}}$$

Rates are typically presented and interpreted per unit of population (i.e., 10,000, 100,000, or 1,000,000 population). For example, a rate of 20 per 10,000 means that for every 10,000 people in the population, 20 experienced the event. Percentages are rates presented per 100 population.

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

Statistical Significance – The term used to describe rates that have been tested and found to be statistically different (i.e., not occurring through chance alone).

Surveillance – The ongoing systematic collection, analysis, and interpretation of health-related data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for prevention and control (Centers for Disease Control and Prevention).

Underlying Cause – The term used to describe the first listed cause of death, that is, the disease or injury that initiated the chain of events leading directly to death.

Weighted Percent – The percentage that has been adjusted to account for the survey design, respondents' probability of selection, demographic differences, and survey non-response when compared to the general population. The weighted percent allows results from a sample to be generalized to the larger population it was drawn from.

Appendix A: 95% Confidence Intervals for BRFSS Data

The information in each title refers to the corresponding figure in the text.

Figure 1-1: Trend in Lifetime Asthma Prevalence Among Adults, Maryland vs. United States, 2000-2010

Year	Maryland Prevalence (95% CI)	United States Prevalence (95% CI)
2000	10.6% (9.5% -11.7%)	10.4% (10.2% - 10.7%)
2001	11.1% (10.0% - 12.2%)	11.0% (10.8% - 11.2%)
2002	12.7% (11.5% - 13.9%)	11.8% (11.6% - 12.0%)
2003	12.3% (11.1% - 13.5%)	11.9% (11.6% - 12.1%)
2004	13.9% (12.7% - 15.2%)	13.3% (13.1% - 13.6%)
2005	13.1% (12.2% - 14.0%)	12.5% (12.2% - 12.7%)
2006	13.4% (12.5% - 14.3%)	12.8% (12.5% - 13.0%)
2007	12.9% (12.0% - 13.8%)	12.9% (12.7% - 13.2%)
2008	14.3% (13.4% - 15.2%)	13.3% (13.1% - 13.5%)
2009	13.9% (13.0% - 14.8%)	13.4% (13.1% - 13.6%)
2010	12.4% (11.6% - 13.2%)	13.5% (13.3% - 13.7%)

Figure 1-2: Trend in Current Asthma Prevalence Among Adults, Maryland vs. United States, 2000-2010

Year	Maryland Prevalence (95% CI)	United States Prevalence (95% CI)
2000	7.3% (6.4% - 8.2%)	7.2% (7.0% - 7.4%)
2001	7.1% (6.2% - 8.0%)	7.2% (7.0% - 7.4%)
2002	8.2% (7.2% - 9.2%)	7.5% (7.3% - 7.7%)
2003	7.8% (6.8% - 8.8%)	7.7% (7.5% - 7.9%)
2004	7.8% (6.8% - 8.8%)	8.1% (7.9% - 8.3%)
2005	8.3% (7.6% - 9.0%)	7.9% (7.7% - 8.0%)
2006	8.9% (8.2% - 9.6%)	8.2% (8.0% - 8.4%)
2007	8.3% (7.6% - 9.0%)	8.2% (8.1% - 8.4%)
2008	9.4% (8.7% - 10.1%)	8.5% (8.3% - 8.7%)
2009	9.1% (8.4% - 9.9%)	8.4% (8.3% - 8.6%)
2010	8.4% (7.7% - 9.1%)	8.6% (8.5% - 8.8%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 1-3: Current Asthma Prevalence Among Adults by Age
Maryland, 2008-2010 (Raw sample size = 2,374)

Age	Prevalence (95% CI)
18-24 years	12.6% (9.8% - 15.4%)
25-34 years	9.3% (7.9% - 10.7%)
35-44 years	8.4% (7.4% - 9.4%)
45-54 years	8.4% (7.5% - 9.3%)
55-64 years	9.1% (8.2% - 10.0%)
65-74 years	8.1% (7.1% - 9.1%)
75+ years	6.5% (5.5% - 7.5%)

Figure 1-4: Current Asthma Prevalence Among Adults by Sex
Maryland, 2008-2010 (Raw sample size = 2,402)

Sex	Prevalence (95% CI)
Male	6.6% (6.0% - 7.2%)
Female	11.1% (10.5% - 11.7%)

Figure 1-5: Current Asthma Prevalence Among Adults by Race/Ethnicity
Maryland, 2008-2010 (Raw sample size = 2,311)

Race/Ethnicity	Prevalence (95% CI)
White, Non-Hispanic	8.6% (8.1% - 9.1%)
Black, Non-Hispanic	10.3% (9.2% - 11.4%)
Hispanic	7.1% (4.9% - 9.4%)
Other, Non-Hispanic	6.9% (4.8 - 9.0%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 1-6: Current Asthma Prevalence Among Adults by Education
Maryland, 2008-2010 (Raw sample size = 2,393)

Education Level	Prevalence (95% CI)
Less than High School	13.8% (11.9% - 15.7%)
High School Grad/GED	9.2% (8.4% - 10.0%)
Some College/Tech School	10.1% (9.2% - 11.0%)
College Graduate	7.4% (6.8% - 8.0%)

Figure 1-7: Current Asthma Prevalence Among Adults by Household Income
Maryland, 2008-2010 (Raw sample size = 2,084)

Income	Prevalence (95% CI)
<$15,000	15.5% (13.3% - 17.7%)
$15,000-$24,999	13.9% (12.4% - 15.5%)
$25,000-$49,999	9.1% (8.2% - 10.1%)
$50,000-$74,999	7.8% (6.8% - 8.9%)
>=$75,000	7.6% (7.0% - 8.2%)

Figure 1-8: Age at Initial Asthma Diagnosis for Adults
Maryland, 2008-2010 (Raw sample size = 1,195)

Age	Prevalence (95% CI)
1-10 years	30.7% (26.0% - 35.4%)
11-17 years	15.8% (12.0% - 19.7%)
18-34 years	21.7% (18.2% - 25.2%)
35-44 years	10.5% (8.4% - 12.6%)
45-54 years	8.1% (6.4% - 9.8%)
55-64 years	4.4% (3.3% - 5.4%)
65+ years	8.8% (5.5% - 12.1%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 1-9: Trend in Lifetime Asthma Prevalence Among Children Ages 0-17 Maryland, 2001-2010

Year	Maryland Prevalence (95% CI)	United States Prevalence (95% CI)
2001	10.6% (NA)	--
2002	11.0% (NA)	11.6% (11.1% - 12.1%)
2003	11.1% (NA)	11.6% (11.2% - 12.0%)
2004	10.2% (NA)	11.8% (11.4% - 12.2%)
2005	13.5% (11.3% - 15.7%)	12.9% (12.4% - 13.4%)
2006	13.1% (11.5% - 14.7%)	12.8% (12.3% - 13.4%)
2007	13.6% (11.9% - 15.3%)	15.5% (13.0% - 14.1%)
2008	14.3% (12.7% - 15.9%)	13.3% (12.8% - 13.7%)
2009	17.1% (15.3% - 18.9%)	13.2% (12.8% - 13.7%)
2010	16.4% (14.6% - 18.2%)	12.6% (12.1% - 13.2%)

Figure 1-10: Trend in Current Asthma Prevalence Among Children Ages 0-17 Maryland, 2003-2010

Year	Maryland Prevalence (95% CI)	United States Prevalence (95% CI)
2003	8.5% (NA)	8.1% (7.8% - 8.4%)
2004	7.6% (NA)	8.3% (7.9% - 8.6%)
2005	9.2% (7.3% - 11.1%)	9.0% (8.6% - 9.4%)
2006	9.1% (7.8% - 10.4%)	9.1% (8.5% - 9.5%)
2007	8.9% (7.5% - 10.3%)	8.9% (8.5% - 9.4%)
2008	9.5% (8.2% - 10.8%)	9.0% (8.6% - 9.4%)
2009	11.9% (10.4% - 13.5%)	8.6% (8.2% - 9.0%)
2010	11.9% (10.3% - 13.5%)	8.4% (8.0% - 8.8%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 1-11: Current Asthma Prevalence Among Children by Age
Maryland, 2008-2010 (Raw sample size = 737)

Age	Maryland Prevalence (95% CI)
< 2 years	3.3% (1.6% - 5.0%)
2-5 years	10.7% (8.7% - 12.7%)
6-11 years	12.9% (11.2% - 14.6%)
12-17 years	12.6% (11.1% - 14.1%)

Figure 1-12: Current Asthma Prevalence Among Children by Sex
Maryland, 2008-2010 (Raw sample size = 788)

Sex	Prevalence (95% CI)
Male	13.4% (12.1% - 14.7%)
Female	8.8% (7.7% - 9.9%)

Figure 1-13: Current Asthma Prevalence Among Children by Race/Ethnicity
Maryland, 2008-2010 (Raw sample size = 762)

Race/Ethnicity	Prevalence (95% CI)
White, Non-Hispanic	7.8% (6.9% - 8.7%)
Black, Non-Hispanic	16.1% (13.9% - 18.3%)
Asian, Non-Hispanic	11.0% (6.3% - 15.7%)
Other, Non-Hispanic	15.2% (6.1% - 24.3%)
Hispanic	9.7% (6.5% - 12.9%)

Figure 1-14: Asthma Lifetime Prevalence for Middle School Students by Grade
Maryland, 2010 (Raw sample size = 29,199)

Grade	Male (95% CI)	Female (95% CI)	Total (95% CI)
6th	21.0% (19.5% - 22.5%)	17.5% (16.2% - 19.0%)	19.2% (18.2% - 20.3%)
7th	21.2% (19.7% - 22.9%)	17.7% (16.2% - 19.4%)	19.4% (18.4% - 20.6%)
8th	23.1% (21.5% - 24.7%)	18.7% (17.3% - 20.2%)	20.8% (19.9% - 21.8%)
Total	21.9% (20.9% - 22.9%)	18.0% (17.2% - 18.8%)	19.9% (19.3% - 20.5%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 1-15: Asthma Lifetime Prevalence for High School Students by Grade Maryland, 2010 (Raw sample size = 56,899)

Grade	Male (95% CI)	Female (95% CI)	Total (95% CI)
9th	24.2% (22.7% - 25.8%)	20.1% (18.8% - 21.5%)	22.1% (21.1% - 23.1%)
10th	22.0% (20.8% - 23.2%)	20.5% (19.4% - 21.7%)	21.2% (20.4% - 22.1%)
11th	22.5% (21.4% - 23.7%)	21.7% (20.6% - 22.9%)	22.1% (21.3% - 22.9%)
12th	20.9% (19.5% - 22.4%)	20.4% (19.2% - 21.7%)	20.7% (19.7% - 21.6%)
Total	22.4% (21.7% - 23.1%)	20.7% (20.2% - 21.3%)	21.5% (21.1% - 22.0%)

Figure 2-1: Smoking Status of Adults by Current Asthma History Maryland, 2008-2010 (Raw sample size = 26,960

Smoking Category	% With Current Asthma	% No Current Asthma	% Never Had Asthma
Current Smoker-Daily	13.2%	13.1%	10.1%
Current Smoker-Some	5.8%	5.4%	4.4%
Former Smoker	24.0%	22.9%	23.9%
Never Smoked	57.0%	58.6%	61.6%

Figure 2-2: Asthma Status of Adult Smokers Maryland, 2008-2010 (Raw sample size = 26,960)

Asthma	% Current Smoker -	% Current Smoker -	% Former Smoker	% Never Smoked
Current Asthma	11.3% (9.9% - 12.8%)	11.4% (9.1% - 13.7%)	9.0% (8.2% - 9.8%)	8.4% (7.9% - 8.9%)
No Current Asthma	5.2% (4.2% - 6.2%)	4.9% (3.3% - 6.5%)	4.0% (3.5% - 4.5%)	4.0% (3.6% - 4.4%)
Never Had Asthma	83.5% (81.8% - 85.2%)	83.7% (81.0% - 86.4%)	87.0% (86.1% - 87.9%)	87.6% (87.0% - 88.3%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 2-3: Percent of Adults Receiving Influenza Vaccination by Asthma Status Maryland, 2010 (Raw sample size = 26,644)

	Flu Shot in the Past Year	
	% YES (95% CI)	% NO (95% CI)
Current Asthma	48.2% (45.7% - 50.7%)	51.8% (49.3% - 54.3%)
No Current Asthma	42.9% (39.1% - 46.7%)	57.1% (53.3% - 60.9%)
Never Had Asthma	40.4% (39.6% - 41.2%)	59.6% (58.8% - 60.4%)

Figure 2-4: Percent of Children with Asthma Receiving the Influenza Vaccination Maryland, 2008-2010 (Raw sample size = 364)

	Flu Shot in the Past Year	
	% YES (95% CI)	% NO (95% CI)
Current Asthma	54.1% (47.4% - 60.9%)	45.9% (39.1% - 52.6%)

Figure 2-5: Leisure Time Physical Activity in Past 30 Days for Adults by Asthma Status Maryland, 2008-2010 (Raw sample size = 27,029)

	Physical Activity in Past 30 Days	
	% YES (95% CI)	% NO (95% CI)
Current Asthma	69.7% (67.5% - 72.0%)	30.3% (28.1% - 32.6%)
No Current Asthma	77.5% (74.4% - 80.7%)	22.5% (19.4% - 25.7%)
Never Had Asthma	77.1% (76.4% - 77.8%)	22.9% (22.2% - 23.6%)

Figure 2-6: Adult Weight Categories by Current Asthma History Maryland, 2008-2010 (Raw sample size = 25,823)

	% Obese (BMI ≥ 30)	% Overweight (BMI 25.0 - 29.9) (95% CI)	Not Overweight/Obese (BMI ≤ 24.9) (95% CI)
Current Asthma	36.6% (34.2% - 39.0%)	31.5% (29.2% - 33.8%)	31.9% (29.6% - 34.3%)
No Current Asthma	33.7% (30.1% - 37.3%)	33.4% (29.8% - 37.0%)	32.9% (29.3% - 36.5%)
Never Had Asthma	25.8% (25.1% - 26.5%)	37.8% (37.0% - 38.6%)	36.5% (35.7% - 37.3%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 3-1: Most Recent Asthma Symptoms Among Adults and Children in the Past Year Maryland, 2008-2010 (Raw sample size: Adults = 1,228; Children = 358)

	Most Recent Asthma Symptoms in the Past Year	
	Adults (95% CI)	**Children (95% CI)**
<1 Week	27.8% (23.8% - 31.8%)	18.2% (12.5% - 23.9%)
1 Week to <3 Months	19.6% (15.7% - 23.5%)	26.7% (20.7% - 32.7%)
3 Months to <1 Year	15.5% (11.9% - 19.1%)	23.2% (17.5% - 29.0%)
≥1 Year	37.1% (32.6% - 41.6%)	31.9% (25.8% - 38.0%)

Figure 3-2: Frequency of Asthma Symptoms Among Adults and Children in the Past Month Maryland, 2008-2010 (Raw sample size: Adults = 1,080; Children = 279)

	Most Recent Asthma Symptoms in the Past Month	
	Adults (95% CI)	**Children (95% CI)**
Every day	10.0% (7.9% - 12.2%)	3.0% (0.5% - 5.5%)
11-29 days	12.1% (8.6% - 15.5%)	9.3% (4.6% - 14.0%)
6-10 days	4.3% (2.9% - 5.8%)	10.1% (4.6% - 15.6%)
3-5 days	11.5% (8.7% - 14.2%)	14.1% (8.4% - 19.8%)
1-2 days	10.4% (6.6% - 14.3%)	12.4% (7.7% - 17.0%)
None	51.7% (46.7% - 56.6%)	51.1% (43.3% - 58.8%)

Figure 3-3: Most Recent Asthma Medication Among Adults and Children Maryland, 2008-2010 (Raw sample size: Adults = 1,202; Children = 362)

	Most Recent Asthma Medication	
	Adults (95% CI)	**Children (95% CI)**
<1 Week	35.6% (31.2% - 40.0%)	35.1% (28.6% - 41.6%)
1 Week to <3 Months	10.8% (7.9% - 13.7%)	17.8% (12.5% - 23.2%)
3 Months to <1 Year	9.9% (7.3% - 12.5%)	13.3% (8.6% - 17.9%)
≥1 Year	43.8% (39.0% - 48.5%)	33.8% (27.5% - 40.0%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 3-4: Number of Nights with Asthma-related Sleeping Difficulty in the Past Month Maryland, 2008-2010 (Raw sample size: Adults = 667; Children = 144)

	Number of Nights with Asthma-related Sleep Difficulty in	
	Adults (95% CI)	Children (95% CI)
Every night	6.8% (3.3% - 10.3%)	1.6% (0.0% - 4.7%)
8-29 nights	11.0% (7.5% - 14.6%)	5.2% (0.4% - 10.0%)
3-7 nights	9.5% (6.3% - 12.8%)	25.5% (14.2% - 36.7%)
1-2 nights	9.8% (6.6% - 12.9%)	11.5% (5.7% - 17.4%)
None	62.9% (56.8% - 68.9%)	56.2% (45.1% - 67.4%)

Figure 3-5: Number of Routine Asthma Check-ups Among Adults and Children in the Past Year Maryland, 2008-2010 (Raw sample size: Adults = 973; Children = 289)

	Number of Routine Asthma Check-ups in Past Year	
	Adults (95% CI)	Children (95% CI)
≥ 6 times	4.0% (2.3% - 5.6%)	6.2% (2.7% - 9.6%)
3-5 times	12.5% (9.4% - 15.5%)	16.0% (9.8% - 22.2%)
1-2 times	38.8% (33.5% - 44.2%)	49.6% (42.2% - 57.1%)
None	44.7% (39.3% - 50.2%)	28.2% (21.5% - 35.0%)

Figure 3-6: Number of Emergency Room Visits Among Adults and Children in the Past Year Maryland, 2008-2010 (Raw sample size: Adults = 978; Children = 291)

	Number of Emergency Room Visits in Past Year	
	Adults (95% CI)	Children (95% CI)
≥ 6 times	0.8% (0.0% - 1.7%)	1.0% (0.0% - 2.4%)
3-5 times	2.0% (1.0% - 3.0%)	3.1% (0.5% - 5.7%)
1-2 times	9.4% (6.2% - 12.7%)	19.6% (13.2% - 25.9%)
None	87.8% (84.4% - 91.3%)	76.4% (69.7% - 83.1%)

Figure 3-7: Number of Doctor Visits in the Past Year for Urgent or Worsening Asthma Symptoms Maryland, 2008-2010 (Raw sample size: Adults = 970; Children = 288)

	Number of Doctor Visits in Past Year	
	Adults (95% CI)	Children (95% CI)
≥ 6 times	1.4% (0.6% - 2.2%)	1.5% (0.1% - 3.0%)
3-5 times	3.6% (1.9% - 5.3%)	6.4% (3.0% - 9.9%)
1-2 times	14.9% (11.5% - 18.4%)	23.5% (16.8% - 30.3%)
None	80.0% (76.2% - 83.9%)	68.5% (61.3% - 75.7%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 3-8: Percentage of Children Experiencing an Asthma Attack in the Past Year Maryland 2008-2010 (Raw sample size: 2,841)

	Percentage Who Experienced an Asthma Attack in the Past Year
	Prevalence (95% CI)
< 10 years	26.9% (20.4% - 33.4%)
10-17 years	17.0% (12.1% - 22.0%)
18-34 years	10.2% (6.1% - 14.3%)
35-44 years	7.3% (5.2% - 9.4%)
45-54 years	6.5% (5.0% - 8.1%)
55-64 years	4.8% (3.5% - 6.1%)
65+ years	4.0% (3.0% - 5.0%)

Figure 3-9: Number of Days Asthma Interfered with Work or Usual Activities Among Adults in the Past Year, Maryland, 2008-2010 (Raw sample size = 954)

	Number of Days Asthma Interfered with Work or Usual Activities in Past Year
	Prevalence (95% CI)
≥ 30 days	4.5% (2.7% - 6.4%)
8-29 days	5.2% (3.3% - 7.1%)
3-7 days	11.1% (8.0% - 14.2%)
1-2 days	9.1% (4.6% - 13.5%)
None	70.1% (64.9% - 75.3%)

Figure 3-10: Perceived Health Status of Adults with Currently Asthma vs. Adults with No Current Asthma, Maryland, 2008-2010 (Raw sample size = 26,759)

Health Status	Percent With Asthma (95% CI)	Percent Without Asthma (95% CI)
Excellent	12.9% (11.3% - 14.6%)	20.1% (17.1% - 23.1%)
Very Good	30.0% (27.7% - 32.3%)	37.5% (33.8% - 41.2%)
Good	31.8% (29.5% - 34.1%)	29.8% (26.3% - 33.3%)
Fair	17.7% (15.8% - 19.6%)	9.6% (7.4% - 11.8%)
Poor	7.6% (6.3% - 8.9%)	2.8% (1.6% - 4.1%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 6-1: Environmental Triggers in the Home of Adults and Children with Asthma Maryland, 2008-2010 (Raw sample size: Adult = ~1,197; Children = ~351)

	Environmental Triggers in the Home	
	Adults (95% CI)	Children (95% CI)
Pets allowed in bedroom	77.5% (72.3% - 82.8%)	64.6% (56.2% - 72.9%)
Carpeting or rugs in bedroom	73.3% (69.4% - 77.3%)	73.3% (67.5% - 79.2%)
Indoor pets	52.3% (47.6% - 56.9%)	54.2% (47.5% - 61.0%)
Gas used for cooking	44.0% (39.4% - 48.7%)	50.7% (44.0% - 57.4%)
Wood-burning fireplace or stove used in home	21.6% (17.7% - 25.5%)	23.5% (18.2% - 28.8%)
Smoking inside home (past week)	12.0% (9.0% - 14.9%)	8.3% (4.3% - 12.3%)
Mold seen/smelled in home (past month)	11.6% (8.4% - 14.7%)	6.7% (3.8% - 9.7%)
Mice or rats seen in home (past month)	9.7% (6.6% - 12.9%)	7.1% (3.7% - 10.4%)
Cockroach seen in home (past month)	5.7% (3.4% - 8.1%)	3.3% (0.3% - 6.3%)
Unvented gas logs, gas fireplace, or gas stove used in home	4.7% (3.0% - 6.6%)	4.2% (1.8% - 6.6%)

Figure 6-2: Environmental Modifications in the Home of Adults and Children with Asthma Maryland, 2008-2010 (Raw sample size: Adults = ~1,238; Children = ~360)

	Environmental Modifications in the Home	
	Adults (95% CI)	Children (95% CI)
Exhaust fan regularly used when cooking	63.6% (59.2% - 68.0%)	73.3% (67.6% - 79.0%)
Exhaust fan regularly used in bathroom	64.0% (59.6% - 68.4%)	64.2% (57.8% - 70.7%)
Ever advised to change things in home	41.5% (36.9% - 46.2%)	35.4% (29.1% - 41.7%)
Dehumidifier regularly used	31.9% (27.5% - 36.2%)	42.0% (35.3% - 48.7%)
Mattress cover used for controlling dust mites	34.8% (30.1% - 39.4%)	36.3% (29.7% - 43.0%)
Air cleaner or purifier regularly used	30.4% (26.1% - 34.7%)	36.3% (29.7% - 42.8%)
Pillow cover used for controlling dust mites	30.1% (25.8% - 34.4%)	31.4% (25.3% - 37.5%)
Sheets and pillow cases washed in hot water	25.5% (21.4% - 29.6%)	21.7% (15.7% - 27.7%)

Appendix A: 95% Confidence Intervals for BRFSS Data

Figure 7-1: Prevalence of Work Related Asthma among Adults with Asthma
Maryland, 2008-2010 (Raw sample size = ~874)

	Prevalence of Work Related Asthma (95% CI)		
	Total	Male	Female
Ever told by health professional that asthma was work-related	6.9% (5.1% - 8.8%)	1.9% (0.8% - 2.9%)	5.1% (3.6% - 6.6%)
Every told health professional that asthma was work-related	9.3% (6.6% - 12.0%)	3.6% (1.3% - 5.9%)	5.7% (4.1% - 7.3%)
Asthma caused by chemicals, smoke, fumes, or dust in current job	10.0% (5.8% - 14.3%)	3.4% (0.8% - 6.0%)	6.6% (3.1% - 10.2%)
Asthma caused by chemicals, smoke, fumes, or dust in any previous job	16.2% (12.4% - 20.1%)	7.4% (3.9% - 10.9%)	8.8% (6.7% - 11.0%)
Asthma made worse by chemicals, smoke, fumes, or dust in any current job	28.9% (22.1%- 35.7%)	8.7% (4.2% - 13.1%)	20.3% (14.2% - 26.3%)
Asthma made worse by chemicals, smoke, fumes, or dust in any previous job	28.7% (24.0% - 33.3%)	10.4% (6.9% - 13.9%)	18.2% (14.4% - 22.1%)
Ever changed or quit a job because chemicals, smoke, fumes, or dust caused or made asthma worse	28.4% (18.5% - 38.4%)	15.6% (5.6% - 25.5%)	12.9% (7.6% - 18.2%)

Figure 8-1: Number of Co-morbid Conditions Among Adults with Asthma
Maryland, 2008-2010 (Raw sample size = ~1,242)

	Number of Co-morbid Conditions
	Prevalence (95% CI)
Depression	31.4% (26.9% - 35.9%)
Chronic Bronchitis	20.7% (17.1% - 24.3%)
COPD	9.5% (7.6% - 11.5%)
Emphysema	5.6% (4.0% - 7.2%)

Figure 9-1: Number of Missed School Days Due to Asthma Among Children in Past Year
Maryland, 2008-2010 (Raw sample size = 229)

	Number of Missed School Days
	Prevalence (95% CI)
1-2 days	19.2% (12.2% - 26.2%)
3-7 days	15.0% (8.9% - 21.0%)
8-29 days	7.8% (2.3% - 13.2%)
≥30 days	1.9% (0.0% - 4.0%)
None	56.2% (47.6% - 64.7%)

Figure 9-2: Asthma Action Plan and Medication at School for Children
Maryland, 2008-2010 (Raw sample size = ~209)

	Prevalence (95% CI)
Child has Asthma Action Plan	44.0% (35.3% - 52.7%)
Child Allowed to Cary Asthma Medication	44.0% (34.8% - 53.1%)

Appendix B: Technical Notes

In this report, unless otherwise stated, the rates calculated are known as "crude" rates because they have not been adjusted in any way. More specifically, it is a measure of overall frequency which has not been adjusted for significant factors which might have influenced the rate (e.g., age, sex, race, or ethnicity). It is the number of cause-specific events (e.g., deaths, disease cases, individuals at risk) over a specified period of time (e.g., a year) divided by the total population.

However, a crude rate can be misleading if an individual wants to compare a population that differs in age because the crude rate for most cause-specific events will be higher in population with a larger proportion of a specific type of individuals (e.g., African Americans, Hispanic/Latino, or the elderly). In such cases where an individual would like to compare populations with different age distributions, an age-adjusted rate should be used.

Age-adjustment is a statistical process applied to rates of death, hospitalizations, disease, or other health outcomes which allows populations with different age distributions to be compared. It is the weighed average of the age-specific (crude) rates, where the weights are the proportions of persons in the corresponding age groups of a standard population. The potential confounding effect of age is reduced when comparing age-adjusted rates computed using the same standard population.

Age confounding occurs when the two populations being compared have different age distributions and the risk of the outcome varies across age groups. The process of age adjustment (direct method) used in this report changes the amount that each age group contributes to the average rate in each area, so that the overall rates are based on the same age structure. Rates based on the same age distribution can be compared to each other without the presence of confounding by age.

Martin O'Malley, Governor

Anthony G. Brown, Lieutenant Governor

Joshua M. Sharfstein, Secretary, DHMH

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