

Asthma in Maryland 2008

Maryland Department of Health and Mental Hygiene
Family Health Administration
Maryland Asthma Control Program

MARYLAND ASTHMA SURVEILLANCE REPORT

2008

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HIGHLIGHTS

- ◆ Statewide, in 2007, approximately 550,000 (12.9%) Maryland adults and 190,000 (13.6%) children had a history of asthma. Of those, approximately 351,000 (8.3%) adults and 123,000 (8.9%) children currently had asthma.
- ◆ Between 2006 and 2008, 9.7% of adults and 5.5% of children with asthma reported losing sleep on 5 or more days during the past month due to asthma symptoms.
- ◆ For adults and children who suffer from asthma between 2006 and 2008, 3.2% of adults and 8.2% of children reported experiencing asthma symptoms every day during the past 30 days.
- ◆ Between 2006 and 2008, more than one-third of school-aged children with asthma (40.9%) missed at least one day of school during the past 12 months due to asthma symptoms.
- ◆ Between 2006 and 2008, approximately one in four (25.2%) of adults with asthma were unable to work for at least one day during the past 12 months due to asthma.
- ◆ Between 2006 and 2008, one in twelve adults with asthma (8.5%) reported having been told by a health professional that their asthma was work-related.
- ◆ In 2007, approximately 9.6% of Medicaid enrollees currently had asthma. Children under the age of 14 had the highest asthma prevalence among Medicaid enrollees (12.1%).
- ◆ In 2007, there were approximately 43,000 asthma-related emergency department visits (78.7 per 10,000 residents) and approximately 9,800 asthma hospitalizations (17.3 per 10,000 residents).
- ◆ From 2003-2007, there was an average of 76.6 deaths per year due to asthma.
- ◆ Many disparities exist in asthma morbidity and mortality. Persons at increased risk for asthma and its complications include the very young, the elderly, Blacks, low-income individuals, and individuals in certain jurisdictions, particularly Baltimore City.
- ◆ In 2007, charges for hospitalizations due to asthma totaled nearly \$62 million. Charges for emergency department visits due to asthma totaled an additional \$32 million.
- ◆ Compared to those without asthma, adults with asthma perceive their general health less favorably.



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 (Bloom, et al., 2003). In 2007, approximately 9.6 million (13.1%) U.S. children under 18 years of age had been diagnosed with asthma at some point in their lifetime, and approximately 6.7 million (9.1%) children currently had asthma (Bloom, et al., 2009). An estimated 24.4 million (11.0%) U.S. adults have been diagnosed with asthma during their lifetime, and an estimated 16.2 million (7.3%) currently have asthma (Pleis, et al., 2009). In 2006, asthma was responsible for 443,600 hospitalizations nationwide (DeFrances, et al., 2008).

This is the seventh 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. 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, for the first time, includes an analysis of data from the CDC Asthma Call-Back Survey on medication usage, and use of an asthma action plan and other self-management practices of persons with asthma. In addition, the report has been expanded to include information about the burden of asthma among Marylanders in school, child care and workplace settings.

Data sources for this surveillance report include the CDC Behavioral Risk Factor Surveillance System (BRFSS), the BRFSS Asthma Call Back Survey, the Youth Tobacco Survey, the Youth Risk Behavior Survey, the Maryland Health Services Cost Review Commission (HSCRC)'s hospital discharge dataset, Maryland Medicaid encounter and claims dataset, and the Maryland Vital Statistics Administration dataset. For BRFSS data, asthma prevalence is identified by respondents to a telephone survey. 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 1999-2007 mortality data. Rates are based on 2007 population statistics from the Vital Statistics Administration. Where possible, rates have been age-adjusted to the 2000 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, the District of Columbia, and three U.S. territories. The survey is designed to monitor the prevalence of major behavioral risk factors associated with chronic disease, injuries, and preventable infectious disease among adults. Each year prior to 2005, approximately 4,400 Maryland residents were surveyed. Between 2005 and 2007, approximately 8,800 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 2007 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.

The Maryland YTS consisted of a total of 48 sampling frames – 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 2006, approximately 89% (24,609) of middle school students and 86% (58,590) of high school students completed a useable questionnaire. This report provides 2006 weighted estimates of current asthma prevalence separately for middle and high school students. The 95% confidence interval (CIs) for these estimates are provided. Estimates are considered significantly different from each other when they do not have overlapping CIs.

PREVALENCE - Continued

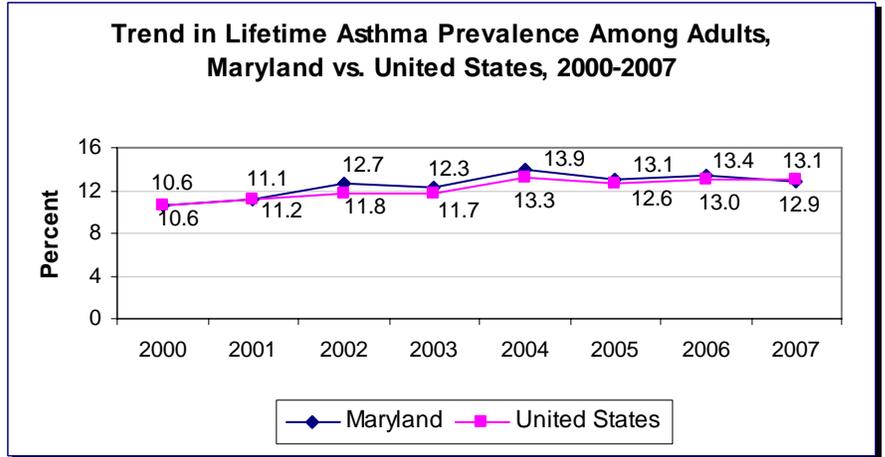
Maryland began participating in the biannual YRBS survey of public high school students, grades 9 through 12 in 2005. That same year, CDC added two questions to assess both lifetime and current prevalence of asthma. The YRBS is a self-administered survey that monitors health risk behaviors affecting morbidity and mortality among high school youth. In 2007, the survey was conducted in 120 classes in 30 schools, resulting in 1,528 (63%) completed surveys. Weighted estimates and their corresponding 95% confidence interval (CIs) are provided. Estimates are considered significantly different from each other when they do not have overlapping CIs. Data from the YTS and the YRBS are presented at the end of the “**Prevalence of Asthma among Children Ages 0-17**” subsection. In interpreting data from the BRFSS, YTS and YRBS on the prevalence of childhood asthma, readers should be aware that the definition of “lifetime asthma” and methods of data collection vary among these three data sources.

PREVALENCE - Continued

Prevalence of Asthma among Adult Ages 18+

Lifetime asthma prevalence showed an increase of approximately 33% from 2000 to 2007. In 2007, the lifetime asthma prevalence was an estimated 550,000 (12.9%) among Maryland adults age 18 and older.

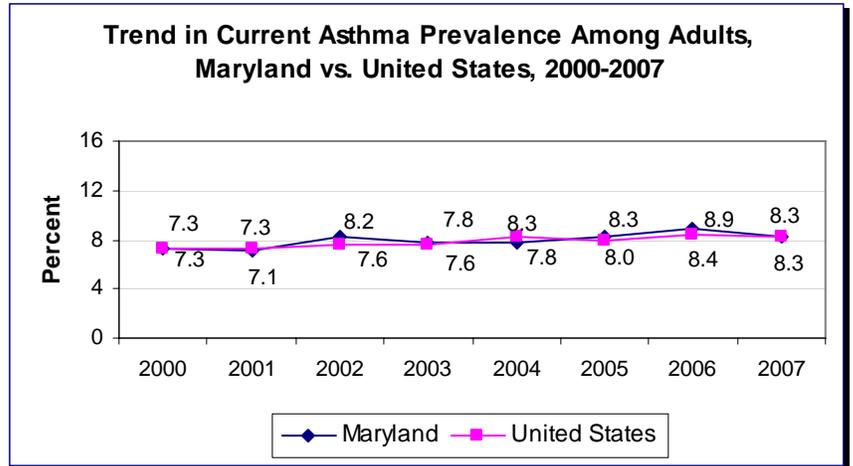
Figure 1-1



Source: BRFSS, 2000-2007

In 2007, the current asthma prevalence was an estimated 35,000 (8.3%) among Maryland adults.

Figure 1-2

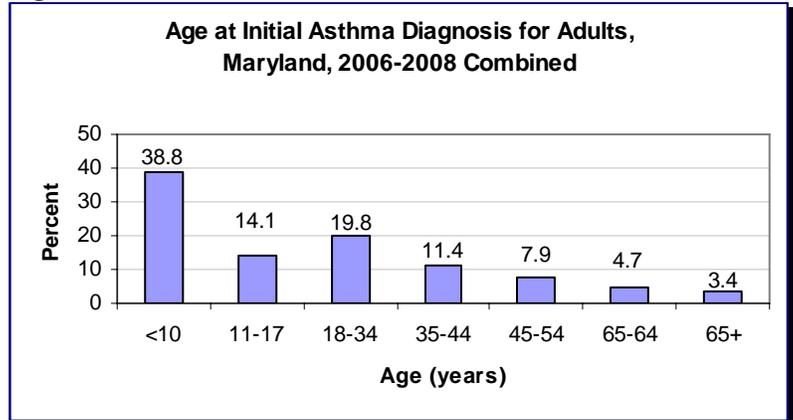


Source: BRFSS, 2000-2007

PREVALENCE - Continued

Between 2006 and 2008, about 39% of adults with asthma were diagnosed as children before the age of 10.

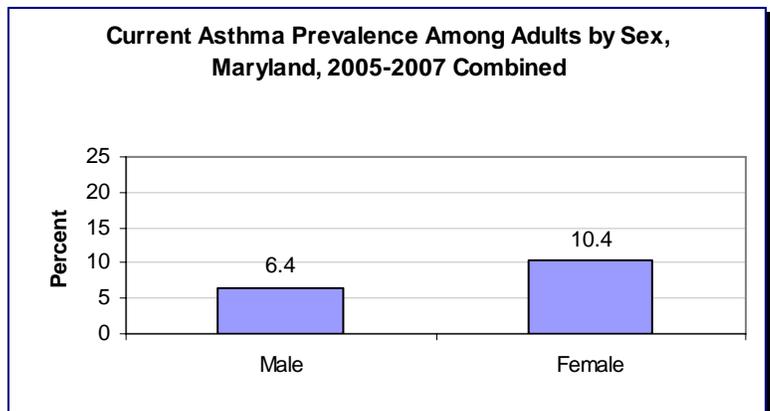
Figure 1-3



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

Between 2005 and 2007, the current asthma prevalence among females (10.4%) was statistically significantly higher than the prevalence among males (6.4%).

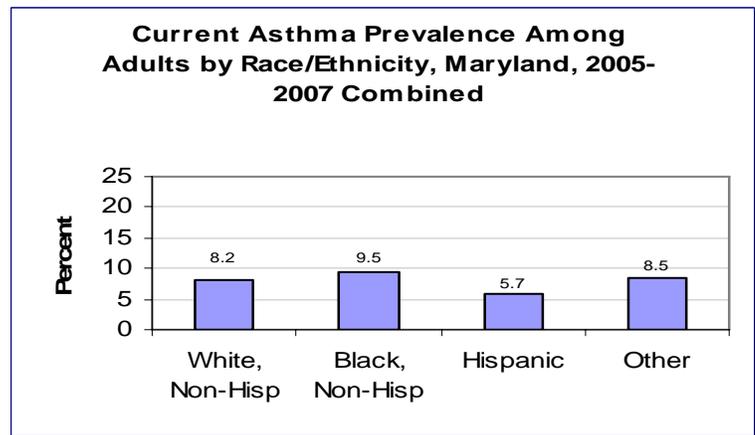
Figure 1-4



Source: Maryland BRFSS, 2005-2007

Between 2005 and 2007, the current asthma prevalence was not significantly different by race and ethnicity.

Figure 1-5

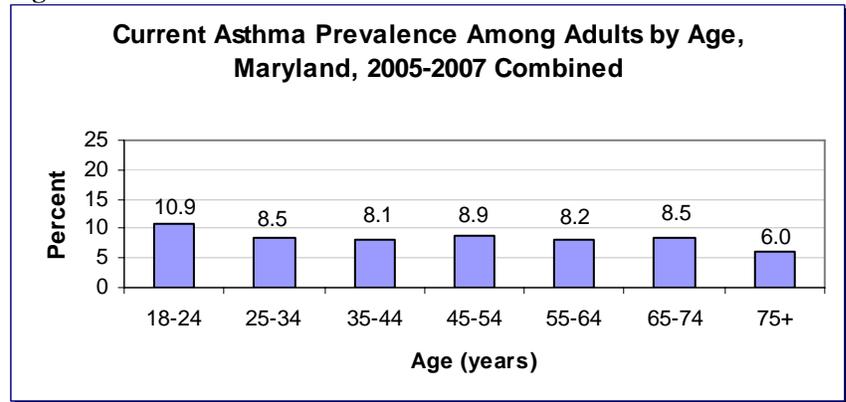


Source: Maryland BRFSS, 2005-2007

PREVALENCE - Continued

Between 2005 and 2007, the current asthma prevalence was highest among adults aged 18-24 years and lowest among adults aged 75 years and older.

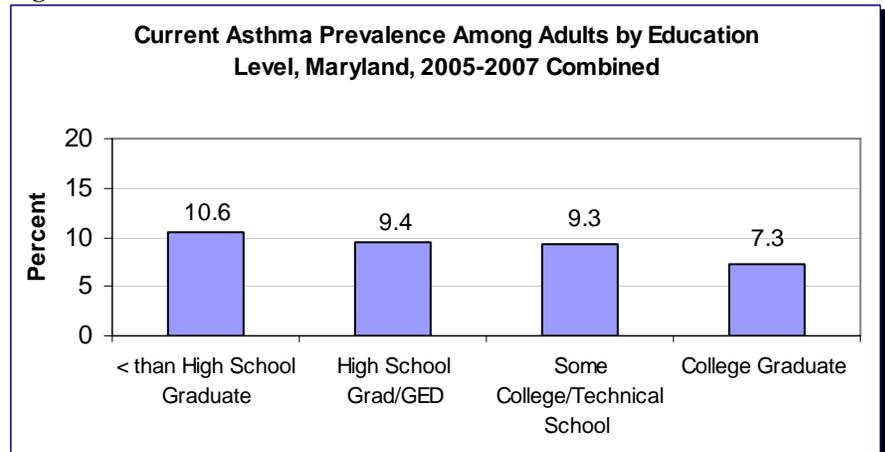
Figure 1-6



Source: Maryland BRFSS, 2005-2007

Between 2005-2007, adults with a college education had significantly lower prevalence of asthma than those with less education.

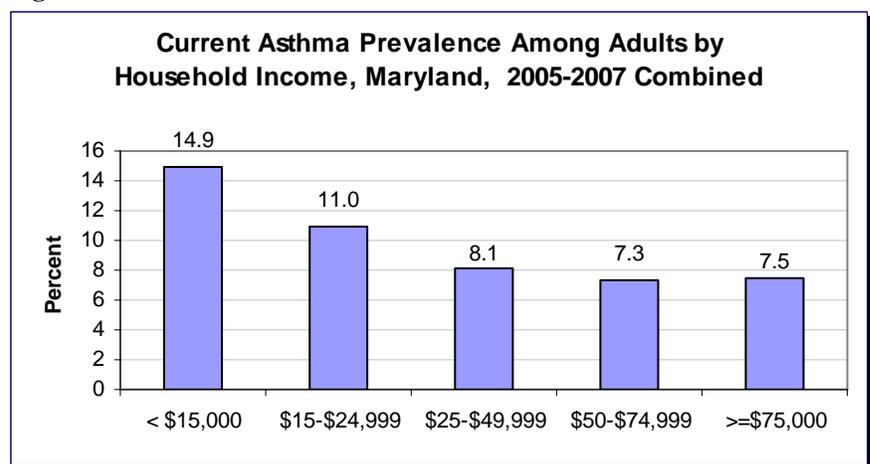
Figure 1-7



Source: Maryland BRFSS, 2005-2007

Between 2005-2007, adults whose annual household income was less than \$15,000 had the highest current asthma prevalence at 14.9%, while adults whose annual household income was \$50,000 and greater had the lowest current asthma prevalence at 7.5%.

Figure 1-8



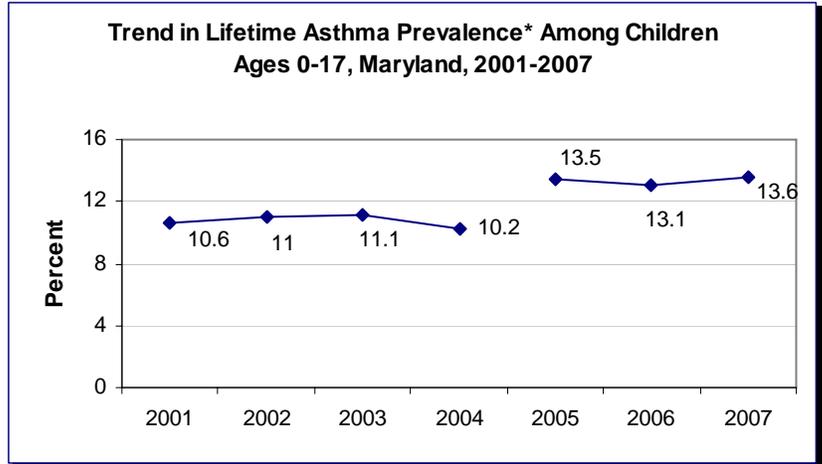
Source: Maryland BRFSS, 2005-2007

PREVALENCE - Continued

Prevalence of Asthma among Children Ages 0-17

Among Maryland children less than 18 years of age, the lifetime asthma prevalence was an estimated 190,000 (13.6%) in 2007.

Figure 1-9

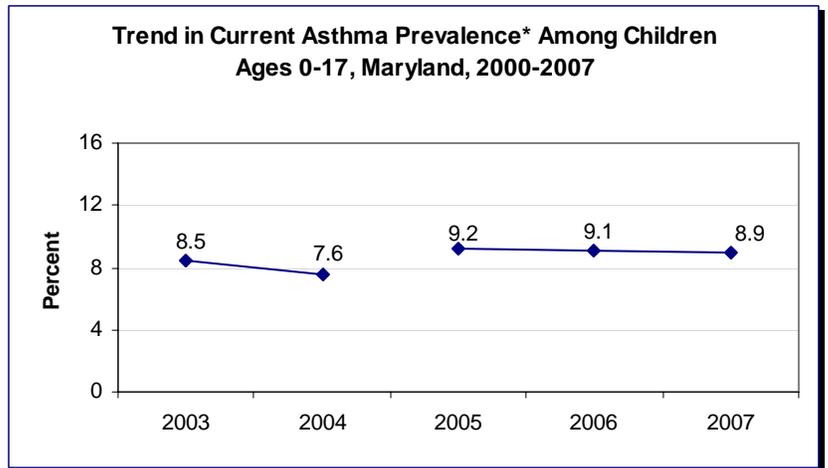


Source: Maryland, BRFSS, 2001-2007

*Survey question changed in 2005. The lifetime prevalence between 2001-2004 and 2005-2007 are not comparable.

Among Maryland children less than 18 years of age, the current asthma prevalence was an estimated 123,400 (8.9%) in 2007.

Figure 1-10



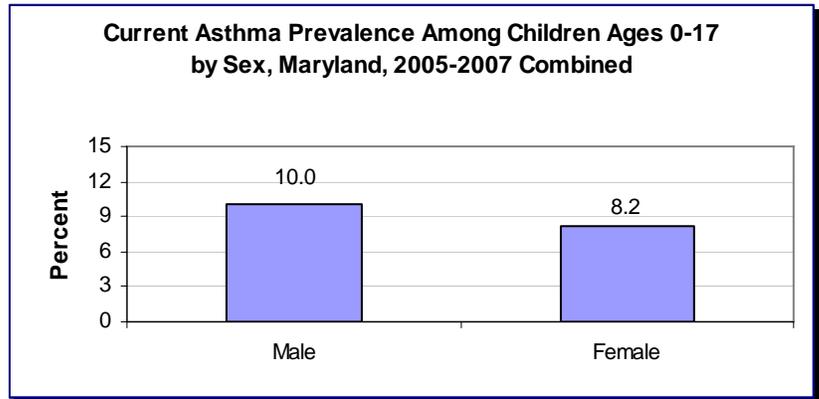
Source: Maryland BRFSS, 2003-2007

*Survey question changed in 2005. The current prevalence between 2003-2004 and 2005-2007 are not comparable.

PREVALENCE - Continued

In 2005-2007, the current asthma prevalence was not significantly different between sexes.

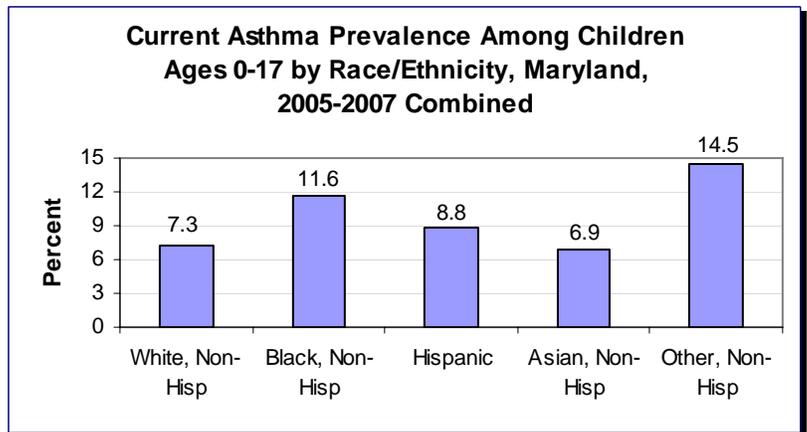
Figure 1-11



Source: Maryland BRFSS, 2005-2007

Between 2005 and 2007, the current asthma prevalence among black children was 60% higher than the prevalence among white children.

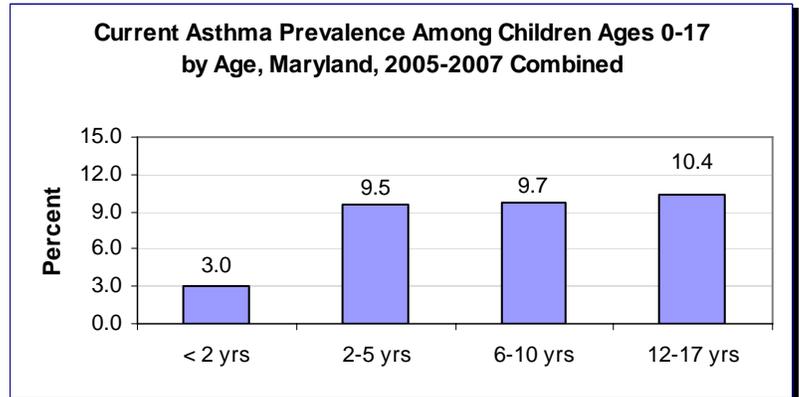
Figure 1-12



Source: Maryland BRFSS, 2005-2007

Between 2005 and 2007, the prevalence of current asthma was lowest among children under the age of 2 and highest among children 12-17 years¹.

Figure 1-13



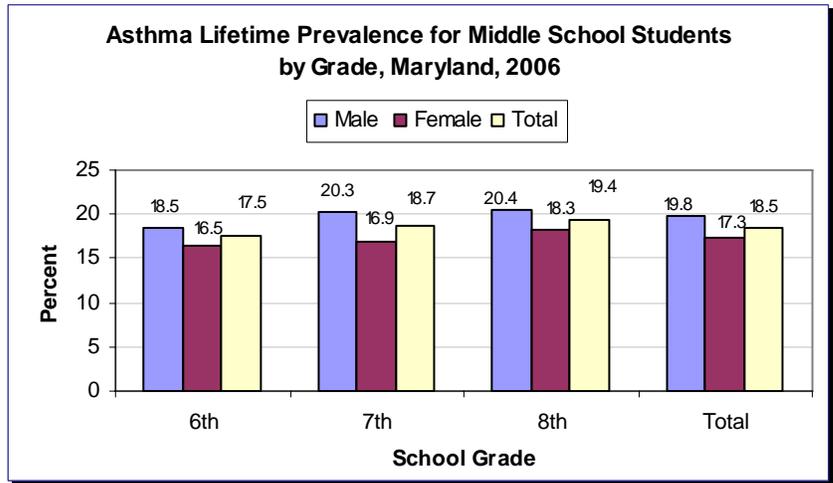
Source: Maryland BRFSS, 2005-2007

¹ Asthma diagnosis is not often made for children under age three

PREVALENCE - Continued

In 2006, approximately 18.5% of middle school children reported having ever been diagnosed with asthma. There was no significant difference between the sexes.

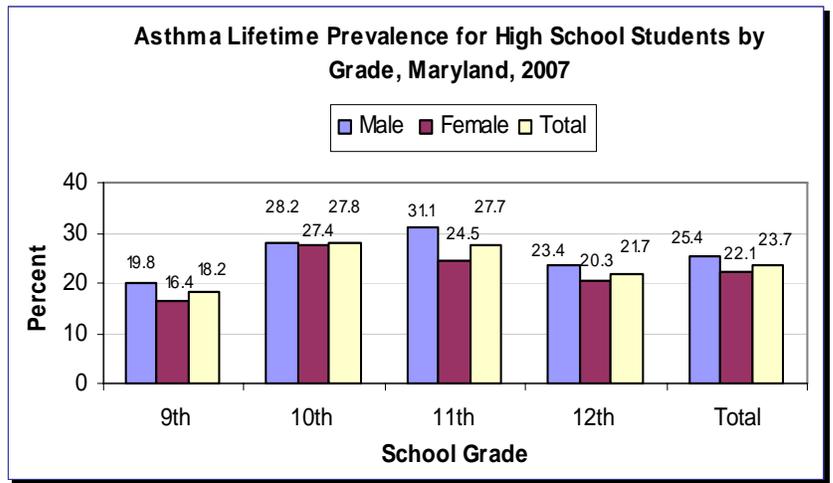
Figure 1-14



Source: Youth Tobacco Survey, 2006

In 2007, high school youth in Maryland reported lifetime asthma prevalence rates that were higher than national rates (23.7 vs. 20.7%, $p=0.05$). Additionally, current asthma prevalence rates were also higher than national rates; 13.4% vs. 10.9%, $p=0.07$).

Figure 1-15

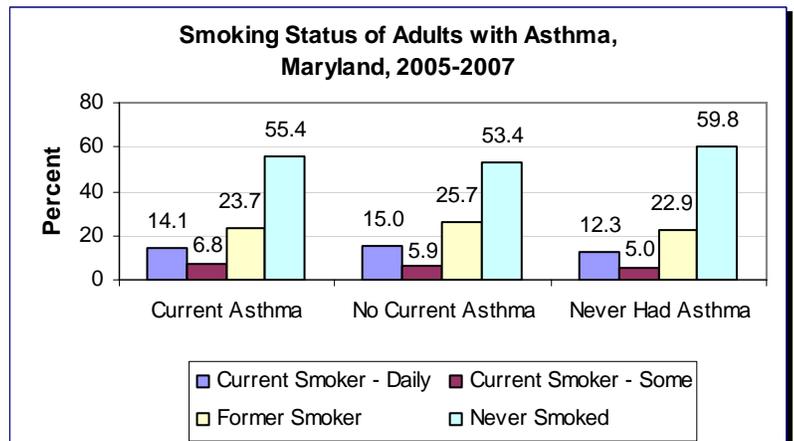


Source: Youth Risk Behavior Survey, 2007

RISK FACTORS AND PREVENTIVE BEHAVIORS

Tobacco is a risk factor associated with asthma. Maryland adults with asthma are more likely to smoke than adults who have never had asthma. Because this data is cross-sectional, it is not possible to determine whether smoking caused asthma among adults.

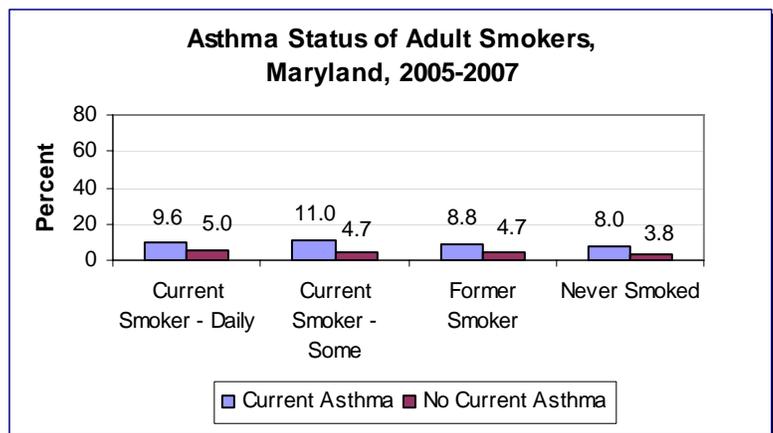
Figure 2-1



Source: Maryland BRFSS, 2005-2007

The prevalence of current asthma is statistically higher among adults who currently smoke some (11.0%) than among those who were “never” (8.0%) smokers. Again, because this data is cross-sectional, it is not possible to determine whether smoking caused asthma among adults.

Figure 2-2



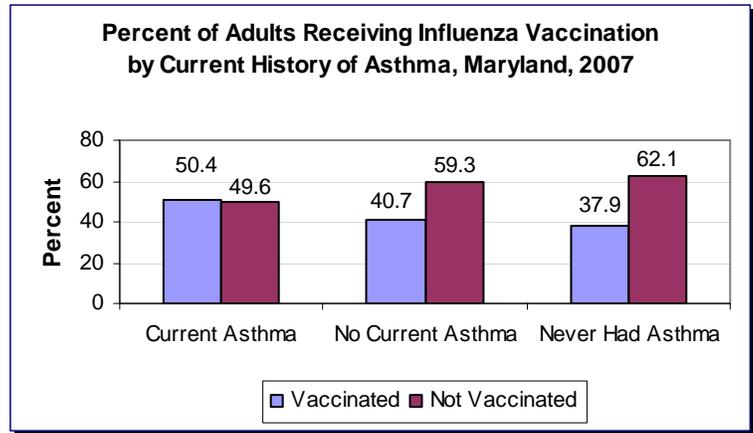
Source: Maryland BRFSS, 2005-2007

RISK FACTORS AND PREVENTIVE BEHAVIORS - Continued

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.

In 2007, the rate of receiving influenza vaccination was comparable between adults with current asthma and adults without current asthma.

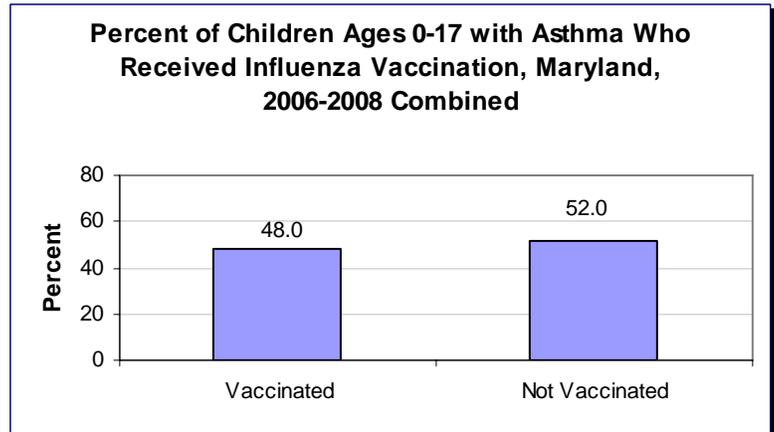
Figure 2-3



Source: Maryland BRFSS, 2005-2007

Nearly half of children with current asthma ages 0-17 (48.0%) received a flu vaccination during the past 12 months.

Figure 2-4



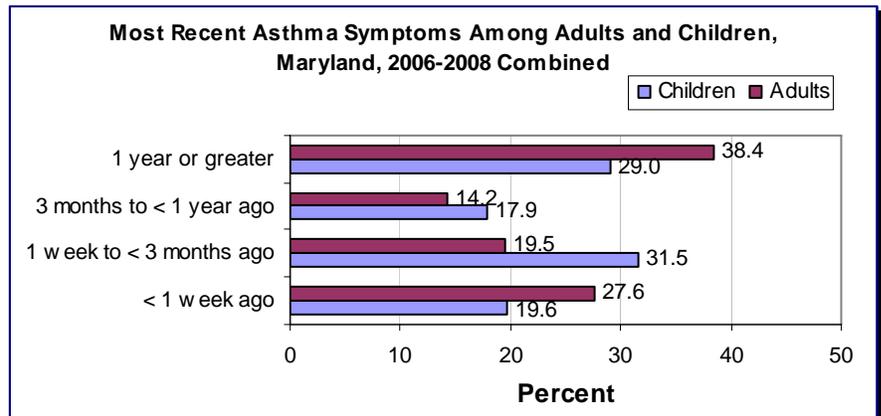
Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

HEALTH STATUS OF MARYLAND ASTHMATICS

In 2006, 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, and the results were weighted to reflect statewide demographics. Data from 2006, 2007, and 2008 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 as such, should be interpreted with caution.¹ 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 comorbidities and work related asthma

Between 2006-2008, nearly one-third of adults (27.6%) and one-fifth of children (19.6%) with asthma experienced their most recent asthma symptom less than one week ago.

Figure 3-1



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

¹ Even though the overall number of responses to this survey or to a particular condition or outcome question is large for statistical inference purposes, sub-analysis 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 you, the reader, into believing that a given finding is much more precise than it actually is.

HEALTH STATUS OF MARYLAND ASTHMATICS - Continued

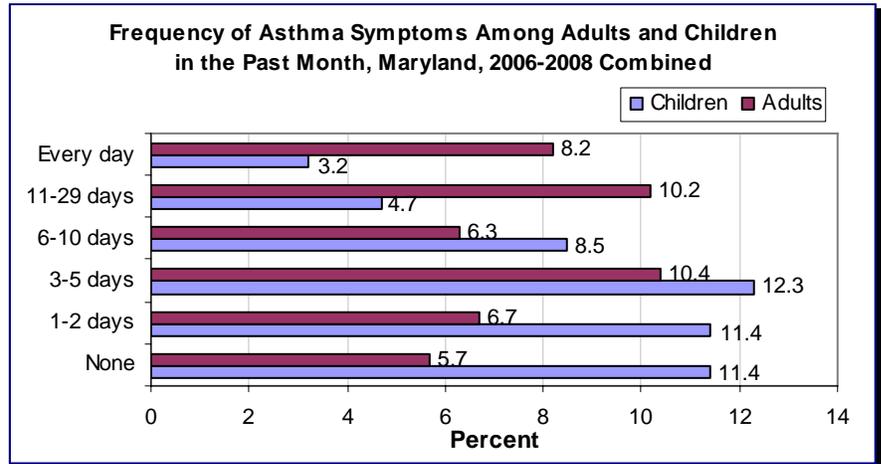
Between 2006 and 2008, only 5.7% of adults with asthma were symptom free during the past month. Eight percent of adults had symptoms every day during the past month.

Eleven percent of children were symptom free during the past month. Three percent had symptoms everyday.

Approximately one-half of adults (52.4%) and of children (48.5%) with asthma were symptom free for more than a month.

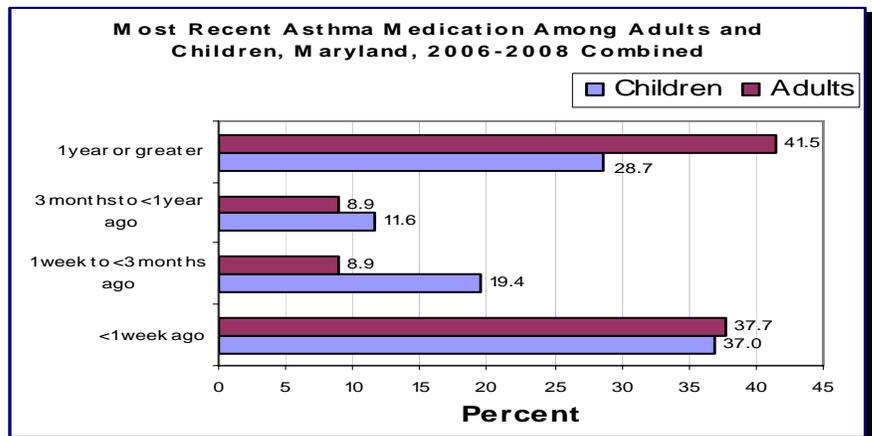
Between 2006-2008, 37.7% of adults and 37.0% of children with asthma used prescribed asthma medication less than a week ago.

Figure 3-2



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

Figure 3-3

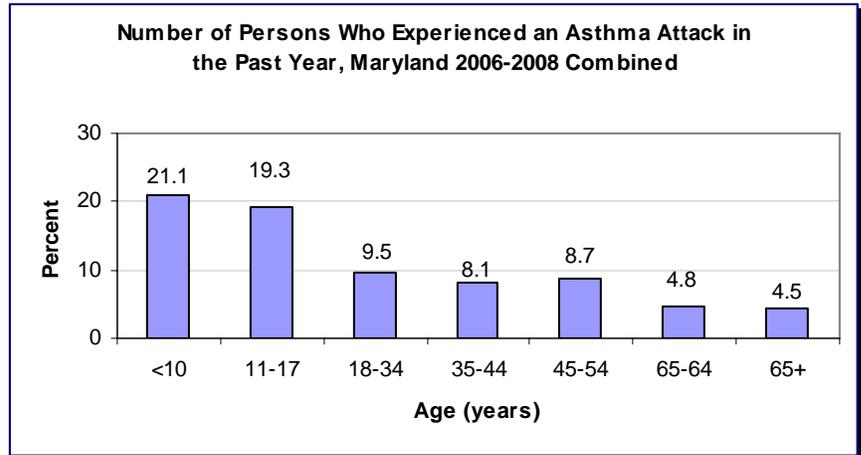


Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

HEALTH STATUS OF MARYLAND ASTHMATICS - Continued

Between 2006 and 2008, one in five children (21.1%) experienced an asthma attack during the past 12 months. A significantly higher percentage of adults ages 18-34 (9.5%) experienced an asthma attack compared to adults ages 65 years and older (4.5%).

Figure 3-4

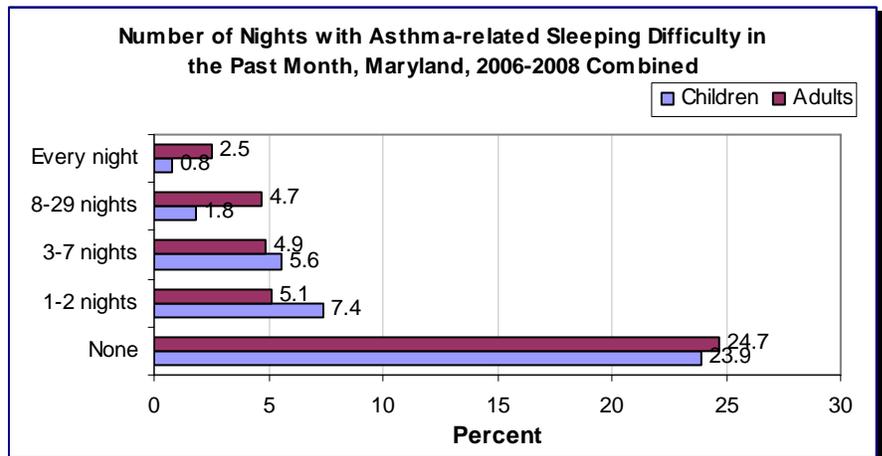


Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

Between 2006 and 2008, approximately three-fifth of adults (58.1%) and of children (60.5%) with asthma were symptom free and as such, had no difficulty sleeping.

41.9% of adults and 39.5% of children with asthma had symptoms in the past month. Of that, one in four adults and children had no difficulty sleeping as a result of their asthma.

Figure 3-5



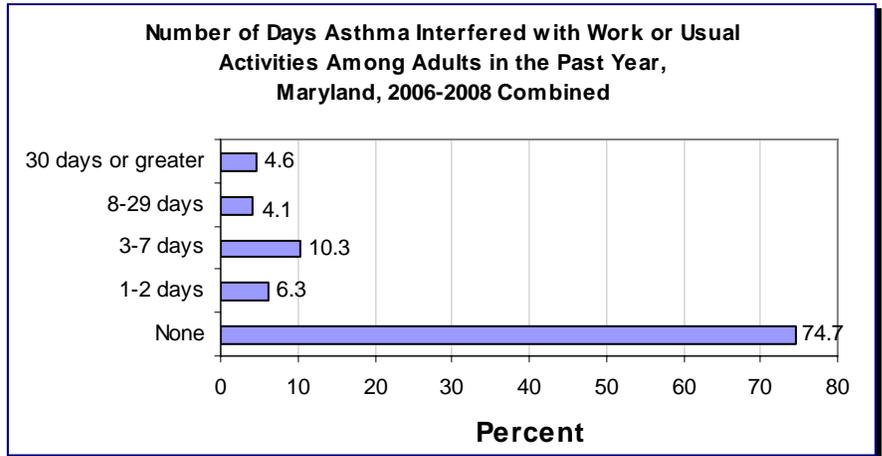
Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

2.5% of adults and 0.8% of children who had symptoms in the past month, had difficulty sleeping every night.

HEALTH STATUS OF MARYLAND ASTHMATICS - Continued

Between 2006 and 2008, approximately 75% of Maryland adults with asthma had no symptoms in the past year that interfered with their work or usual activities. Approximately 5% of Maryland adults with asthma had at least 30 days of asthma symptoms in the past year that interfered with their work or usual activities (data not included in figure).

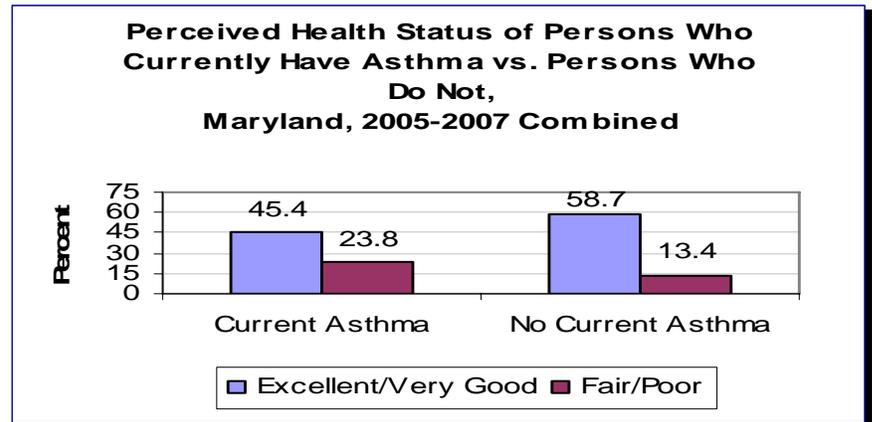
Figure 3-6



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

In general, Maryland adults with current asthma consider their health to be poorer than those without current asthma. From 2005 to 2007, adults with current asthma were statistically significantly less likely than adults without current asthma to report their general health status as excellent or good (45.4% vs. 58.7%). Likewise, adults with current asthma were statistically significantly more likely to report their general health status as fair or poor (23.8% vs. 13.4%).

Figure 3-7

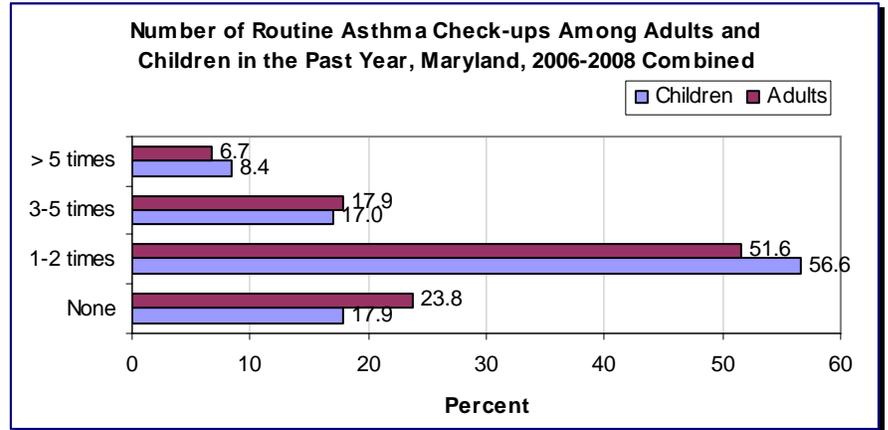


Source: Maryland BRFSS, 2005-2007

HEALTH STATUS OF MARYLAND ASTHMATICS - Continued

Between 2006-2008, more than one-half of adults (51.6%) and children (56.6%) had 1-2 routine check-ups for their asthma in the year.

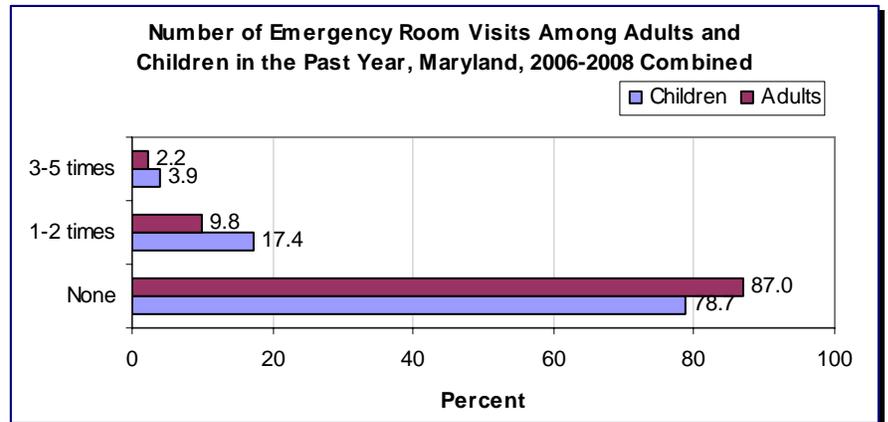
Figure 3-8



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

Between 2006-2008, 87.0% of adults and 78.7% of children had no visits to the emergency room for their asthma in the year.

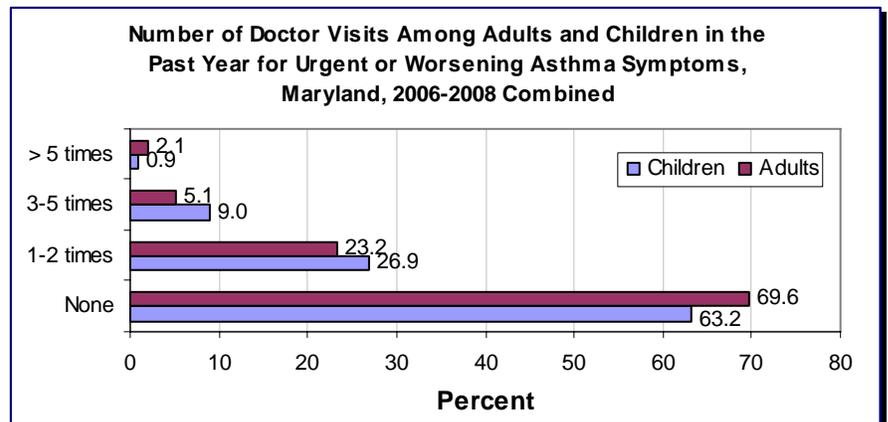
Figure 3-9



Source: Maryland BRFSS, 2005-2007

Between 2006 and 2008, not including those who visited the emergency room or urgent care centers, about 70% of adults and 63% of children with asthma did not see a doctor at least once during the past year for urgent or worsening asthma symptoms.

Figure 3-10



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

ASTHMA SELF-MANAGEMENT KNOWLEDGE

Table 4.1: Asthma Self-Management Knowledge Among Adults and Children, Maryland, 2006-2008 Combined

	Adult (18+) 2006-2008 Weighted Percent (95% CI)	Child (0-17) 2006-2008 Weighted Percent (95% CI)
Taught to recognize early sign or symptoms	45.6 (41.5-49.8)	58.9 (52.4-65.4)
Taught what to do during an asthma episode or attack	51.8 (47.7-56.0)	61.9 (55.5-68.3)
Taught to use a peak flow meter to adjust daily medication	33.7 (29.9-37.5)	30.6 (24.5-36.7)
Given an asthma action plan	22.4 (18.9-25.8)	26.4 (20.6-32.3)
Taken a course or class on how to manage asthma	3.8 (2.6-4.9)	7.5 (4.0-10.9)

Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

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 2006 and 2008, 58.9% 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 and 61.9% reported being taught what to do during an asthma attack. 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 (45.6%) or what to do during an asthma attack (51.8%).

ASTHMA MEDICATION USE

Table 5-1: Asthma Medication Use Among Adults and Children, Maryland, 2006-2008 Combined

	Adult (18+) 2006-2008 Weighted Percent (95% CI)	Child (0-17) 2006-2008 Weighted Percent (95% CI)
Ever used over-the-counter-medication	19.2 (16.2-22.1)	11.0 (7.1-14.9)
Ever used prescription inhaler	65.0 (60.8-69.2)	62.8 (56.5-69.1)
Taught to use prescription inhaler	67.9 (63.5-72.3)	68.8 (62.4-75.3)
Taken prescription asthma medication using an inhaler during the past 3 months	88.1 (84.2-92.1)	85.7 (78.6-92.8)
Taken asthma medication in pill form during the past 3 months	29.5 (21.5-38.0)	29.7 (24.7-34.2)
Taken asthma medication using a nebulizer during the past 3 months	19.4 (15.0-23.7)	41.1 (32.2-50.1)

Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

A higher percentage of adults with current asthma have used over-the-counter asthma medications when compared to children. Reported prescription inhaler use was similar among adults and children. However, only 68.8% of these children who had used an inhaler also had a health professional teach them how to use it.

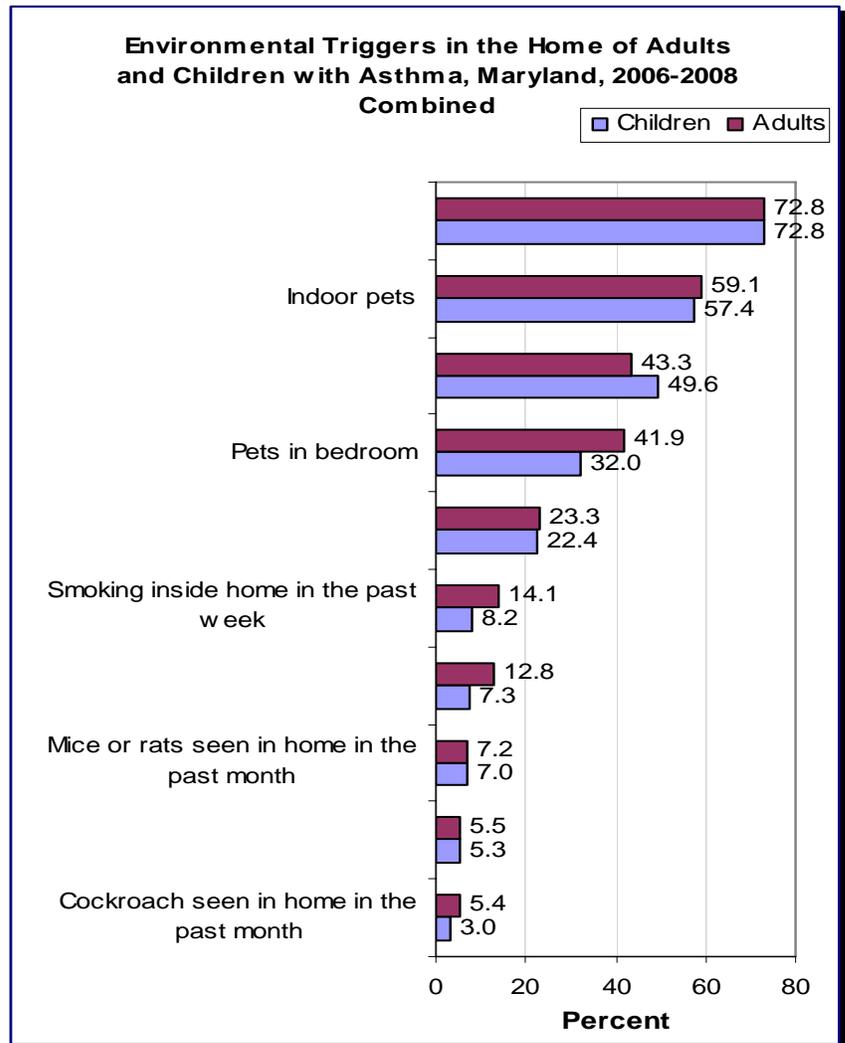
During the past 3 months, twice as many children used prescription asthma medication with an inhaler or in pill form than adults.

INDOOR ENVIRONMENTAL EXPOSURES

People generally spend the majority of their time indoors, so 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, excess moisture, and sulfur oxides.

The majority of adults and children reported exposure to carpeting/rugs, using gas for cooking, or pets inside the home. 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



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

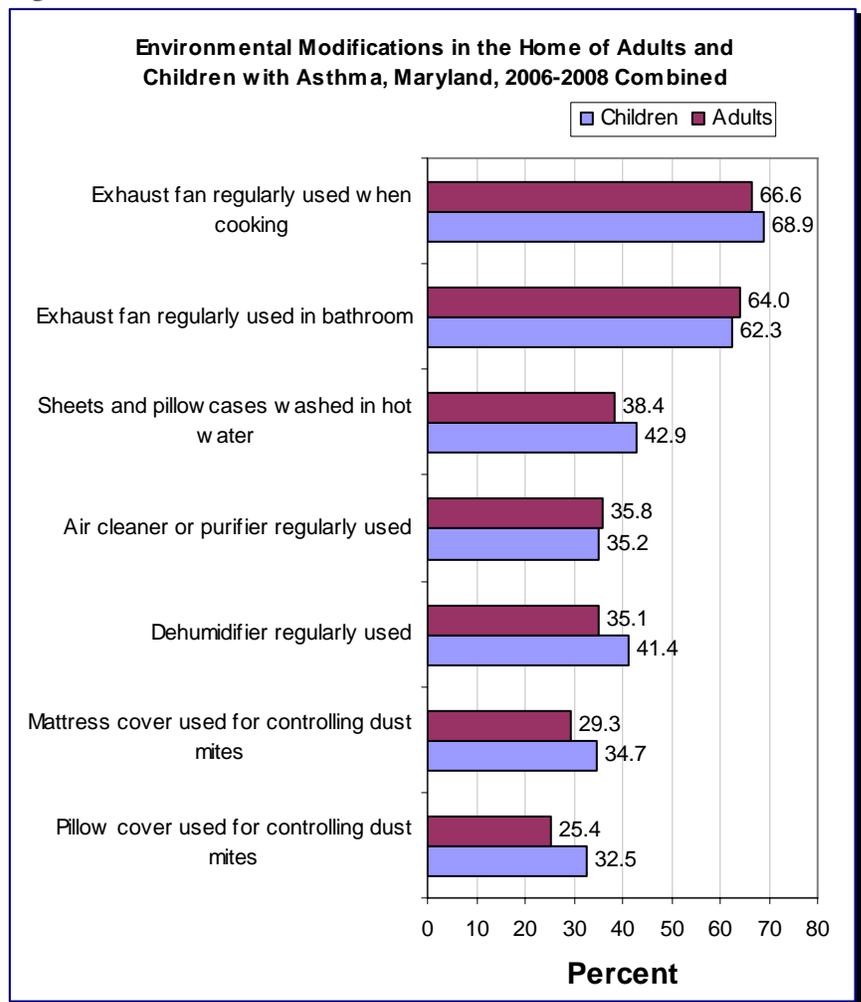
INDOOR ENVIRONMENTAL EXPOSURES - Continued

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 compounds (VOCs). VOCs are organic compounds that evaporate at a relatively low temperature and contribute to air pollution. Examples include ethylene, propylene, benzene, or 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. The other environmental modifications were implemented in two-fifth or fewer homes. Environmental modifications were similar in homes of adults and children with asthma.

Figure 6-2

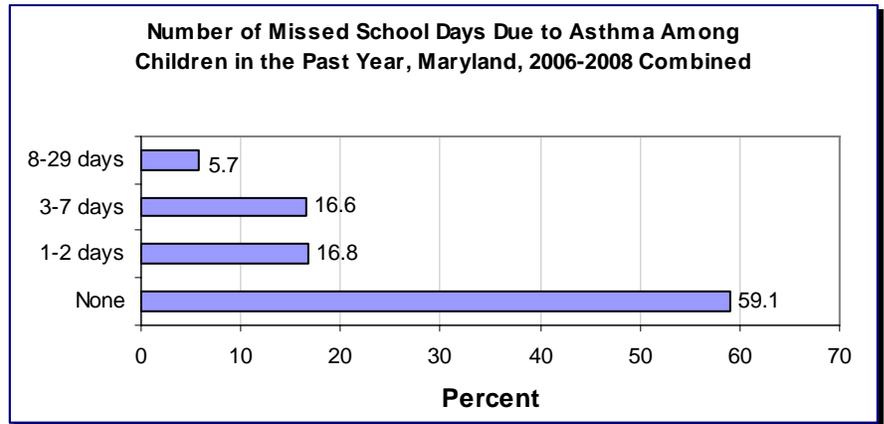


Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

ASTHMA AMONG SCHOOL-AGED CHILDREN

Nationally, asthma is a leading cause of school absenteeism. Data showed that in Maryland, asthma contributes to school absenteeism. Among parents of school-aged children with asthma, 16.8% reported that their child missed 1-2 days of school because of asthma during the past 12 months, and 5.7% said their child missed 8-29 days due to asthma. Three-fifths of parents (59.1%) reported that their child missed no days of school due to asthma.

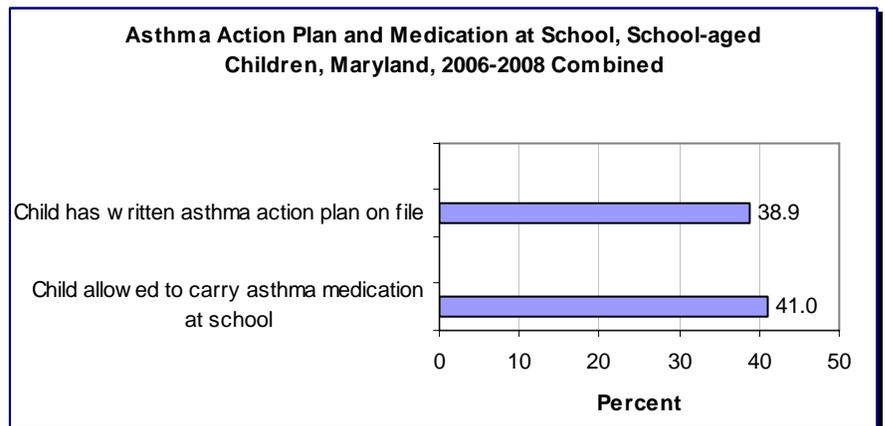
Figure 7-1



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

The Maryland Asthma Control Program encourages schools to maintain a written asthma action plan on file for all students with current asthma. Between 2006 and 2008, less than one-half of parents of children with current asthma reported that their children had an asthma action plan on file at their school (38.9%).

Figure 7-2



Source: : Maryland BRFSS Asthma Call Back Survey, 2006-2008

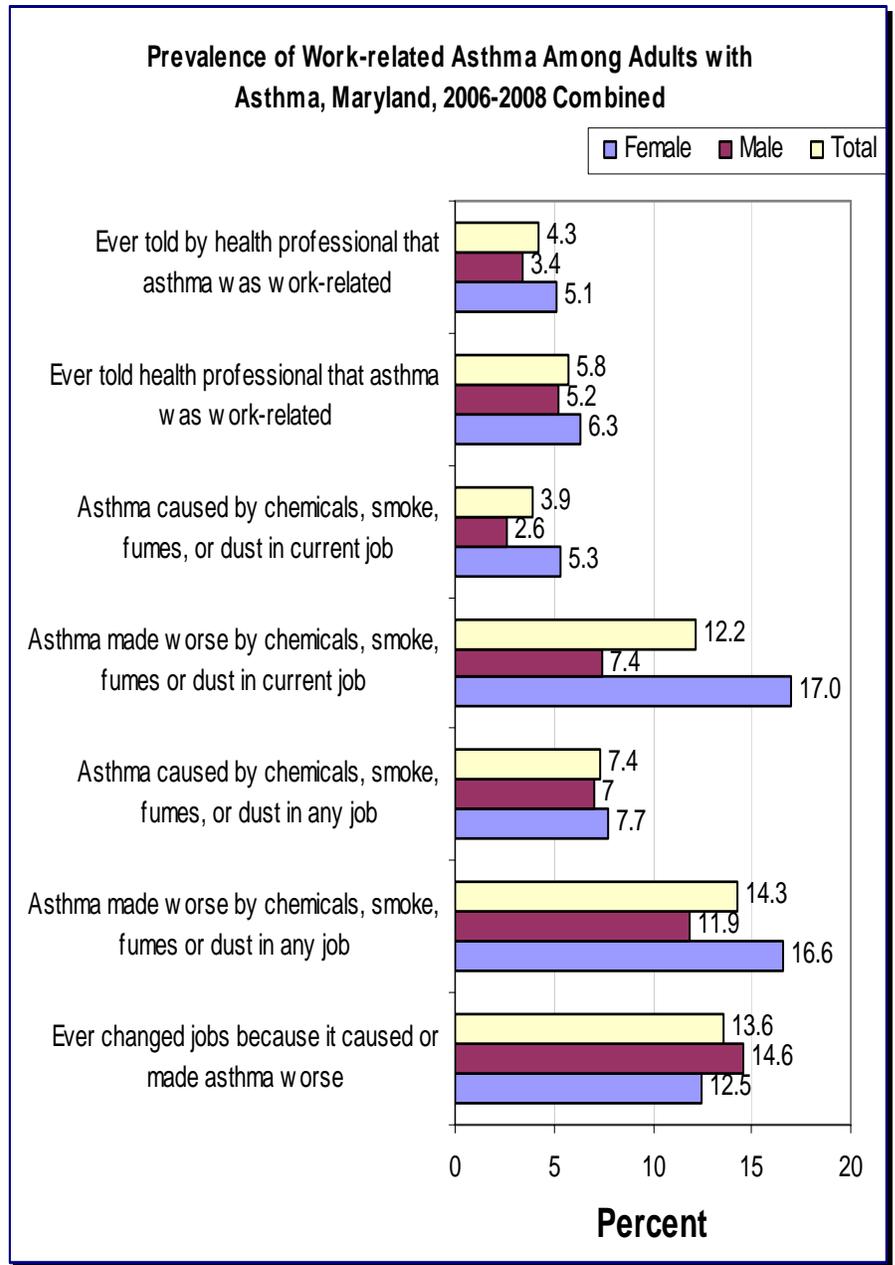
In 2005, the Maryland General Assembly passed legislation (House Bill 143) creating a new statute, §7-421 of the Education Article, Annotated Code of Maryland, which requires public school systems to adopt policies authorizing students to possess and self-administer an asthma inhaler or other emergency medication for treatment of asthma or other airway constricting disease. However, between 2006 and 2008, only 41.0% of parents of children with asthma reported that their children were allowed to carry their asthma medications at school.

WORK-RELATED ASTHMA

Work-Related Asthma (WRA) is defined as 1) asthma that is caused by exposure to substances in the work environment, and 2) pre-existing asthma that is triggered or made worse by exposure to one or more substances in the work environment.

Between 2006 and 2008, 4.3% of adults with asthma said that a health professional has told them their asthma was work-related, and 5.8% said they have told a health professional that their asthma was work-related. A higher percentage of females with asthma believed that their asthma was made worse by their jobs (17.0%) when compared to males (7.4%). Nearly one-third of individuals who have ever been diagnosed with asthma reported having left a job because it caused or worsened their asthma symptoms (13.6%).

Figure 8-1



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

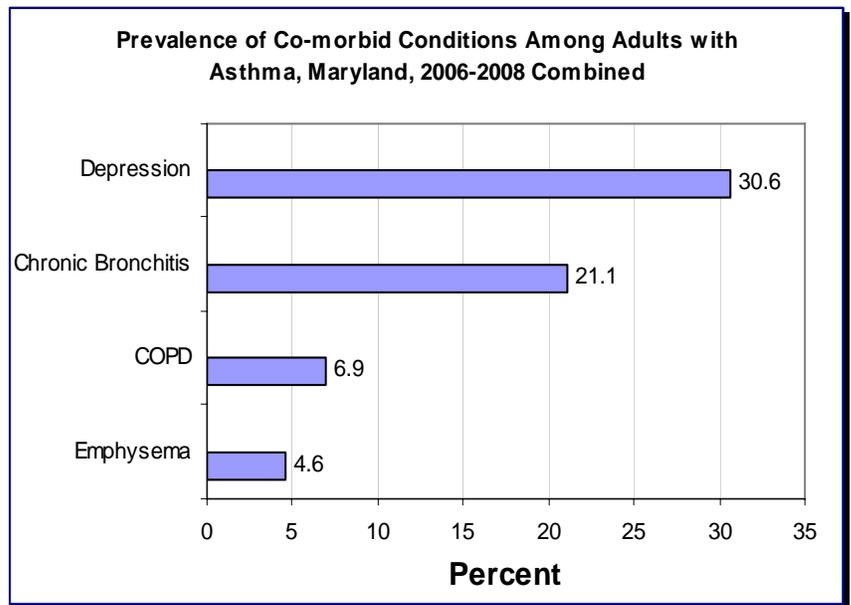
COMORBID CONDITIONS

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 Callback Survey includes separate questions about the respondent’s history of COPD, emphysema and chronic bronchitis.

Overall, 33% of adults with asthma had been diagnosed with COPD (i.e., answered “yes” to having been diagnosed with COPD or emphysema or chronic bronchitis). Chronic bronchitis had been diagnosed in one out of five adults with current asthma. About 30% of adults with asthma had been diagnosed with depression. These findings do not imply that having asthma leads to any of these conditions or vice versa. It is clear that there is an association between these conditions, but more research is needed to determine exactly how they are related.

Figure 9-1



Source: Maryland BRFSS Asthma Call Back Survey, 2006-2008

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 2007. The data are based upon the number of visits to the ED and not the number of unique individuals who visited the ED.

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.^{1,2,3}



¹ Reports prior to 2002 presented ED visits/year data determined by admission date. Currently, ED visits/year were determined by discharge date. Additionally, rather than creating zip code-specific county data, county-specific data, already provided by HSCRC, was used in 2006 and 2007 reports to abstract ambulatory discharge data. Focusing on the county-specific data is viewed to be more accurate since many of the zip codes belong to more than one county.

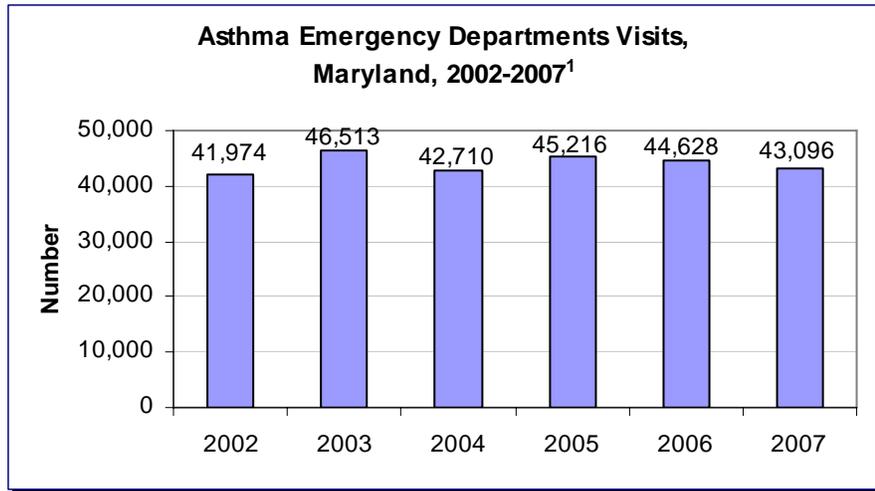
² Data collection methodology changed in July of 2007. ED visits prior to 2007 are not comparable to 2007 and beyond.

³ Reports prior to 2007 data presented ED visits/year data determined by encounter type. Currently, ED visits/year were determined by ED charges.

EMERGENCY DEPARTMENT VISITS - Continued

In 2007, there were approximately 38,136 ED visits in Maryland with asthma as a principal Diagnosis.

Figure 10-1

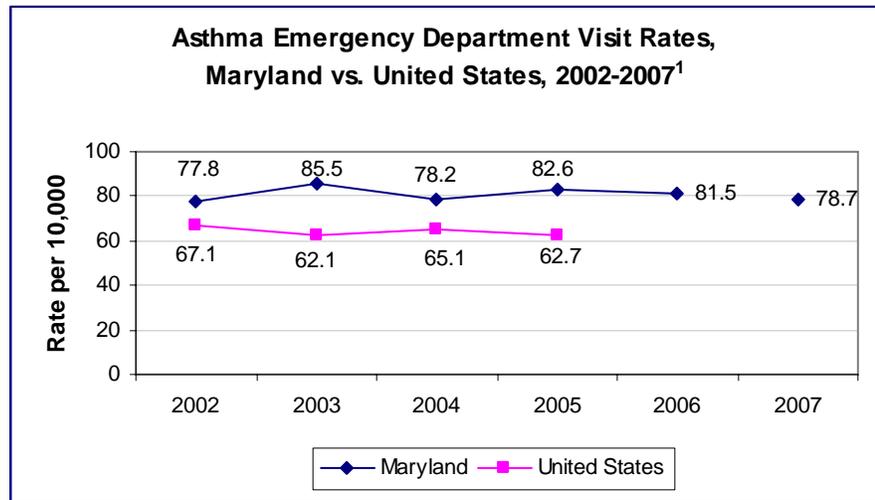


Source: HSCRC ambulatory care data, 2002-2007

¹ Data collection methodology changed in July 2007; and as such, are not comparable to previous years.

The overall rate of ED visits due to asthma was 78.7 per 10,000 population in 2007. Maryland asthma ED visit rates are higher than the 2005 national rate of 62.7 visits per 10,000 population.

Figure 10-2



Source: HSCRC ambulatory care data, 2002-2007, United States data from National Center for Health Statistics (NCHS).

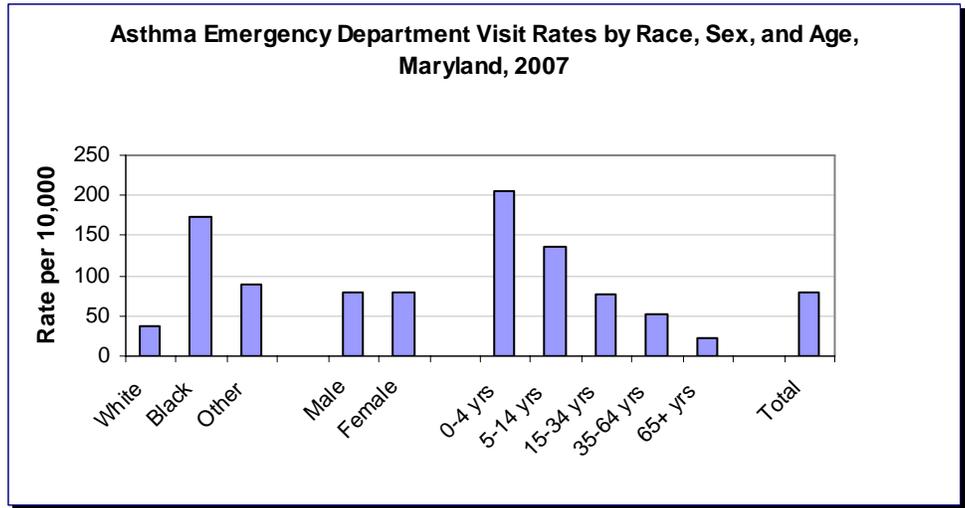
Rates are age adjusted to the 2000 U.S. standard population.

¹ Data collection methodology changed in July 2007; and as such are not comparable to previous years.

EMERGENCY DEPARTMENT VISITS - Continued

Blacks in Maryland visit the ED for asthma at four times the rate of Whites (164.0 vs. 35.3 per 10,000). Young children are brought to the ED for asthma more often than adults.

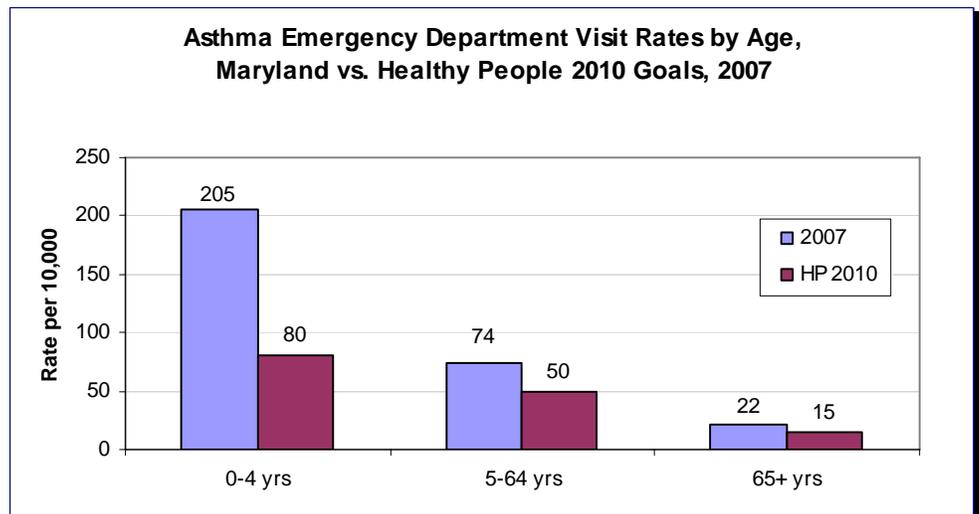
Figure 10-3



Source: HSCRC ambulatory care data, 2007

ED visit rates exceed the Healthy People 2010 goals for all age groups. This difference remains most dramatic for children under 5 years of age. While the Healthy People 2010 goal is 80 visits per 10,000 population, Maryland's youngest children (age 0-4) had 205 visits per 10,000 population in 2007.

Figure 10-4



Source: HSCRC ambulatory care data, 2007, Healthy People 2010 Midcourse Review, U.S. Department of Health and Human Services, 2007

HOSPITALIZATIONS

Hospitalizations for asthma, like ED visits, are generally considered a failure of outpatient management. Maryland hospitalization data from 2001-2007 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 these data do 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 2007. The data, which lack unique identifiers, are based upon the number of admissions to the hospital and not the number of individuals who were admitted to the hospital. Since some Maryland residents are hospitalized in neighboring states, data on hospitalization of Maryland residents from the District of Columbia, West Virginia, Pennsylvania¹, and Delaware, 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.²



¹ “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 health care 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, express 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.

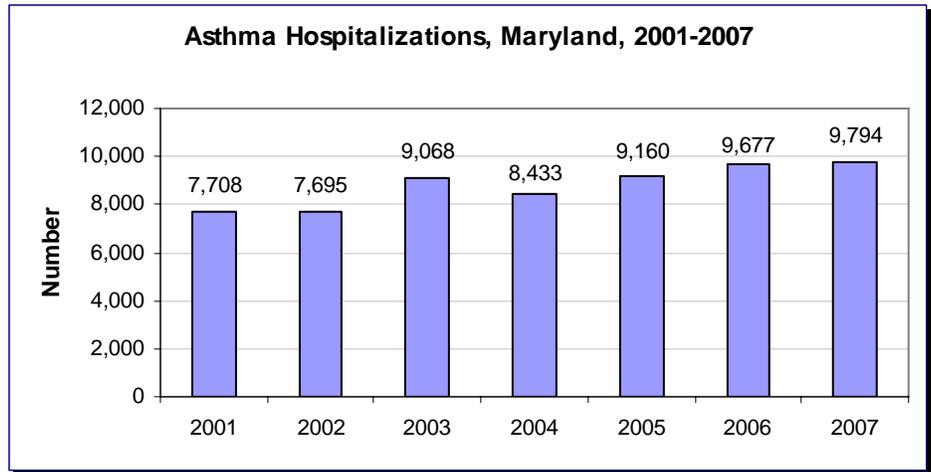
This analysis was not prepared by PHC4. This analysis was done by MACP. PHC4, its agents and staff, bear no responsibility or liability for the results of the analysis, which are solely the opinion of MACP.”

² Reports prior to 2002 presented hospitalizations/year data determined by admission date. Currently, hospitalizations/year were determined by discharge date. Additionally, instead of creating zip code-specific county data, county-specific data, already provided by HSCRC, was used in 2006 and 2007 reports to abstract hospital discharge data. 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

There were approximately 9,794 hospitalizations of Maryland residents with a principal diagnosis of asthma in 2007. An additional 658 Maryland residents were hospitalized for asthma in neighboring states/jurisdictions. The majority of these Maryland residents were hospitalized in the District of Columbia (565), with 15 hospitalized in West Virginia, 33 in Pennsylvania, and 45 in Delaware.

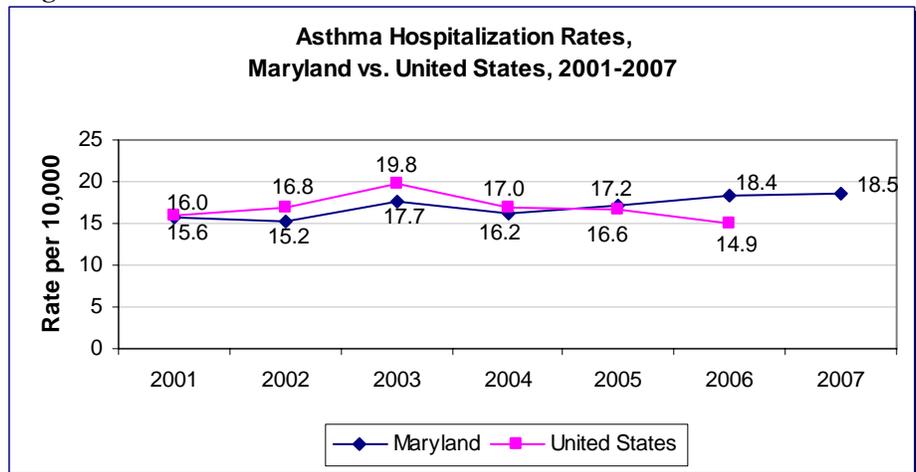
Figure 11-1



Source: HSCRC hospital discharge data, 2001-2007

The hospitalization rate for Maryland residents was 17.3 per 10,000 population excluding those hospitalizations outside of Maryland, and increased to 18.5 per 10,000 population when hospitalizations outside of Maryland are included. These rates are higher than that for the United States as a whole, which averaged 17.0 hospitalizations per 10,000 between 2002 and 2006.

Figure 11-2



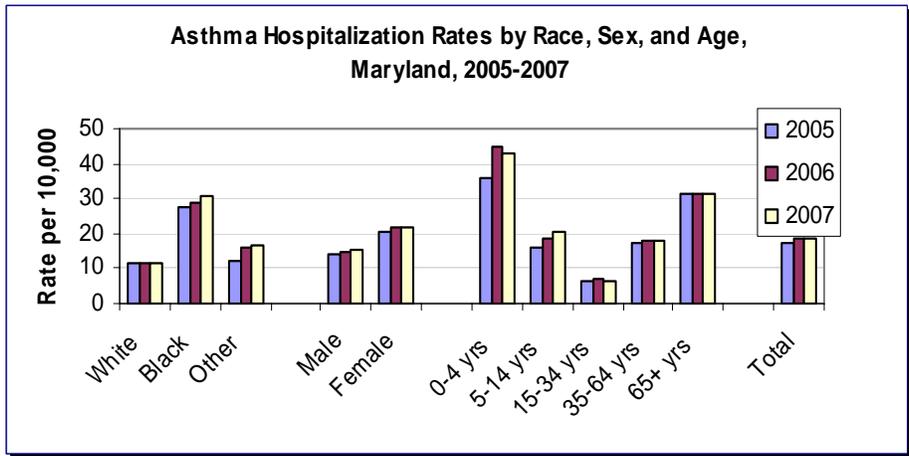
Source: HSCRC hospital discharge data, Maryland Health Care Commission, West Virginia Health Care Authority, Pennsylvania Health Care Cost Containment Council, and Delaware Department of Health, 2001-2007.

Hospitalizations of Maryland residents in D.C., West Virginia, Pennsylvania, and Delaware are included in all data. Rates are age adjusted to the 2000 U.S. standard population.

HOSPITALIZATIONS - Continued

In 2007, hospitalization rates for Blacks continued to be nearly three times that of 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; a rate of 42.1 hospitalizations per 10,000 population.

Figure 11-3

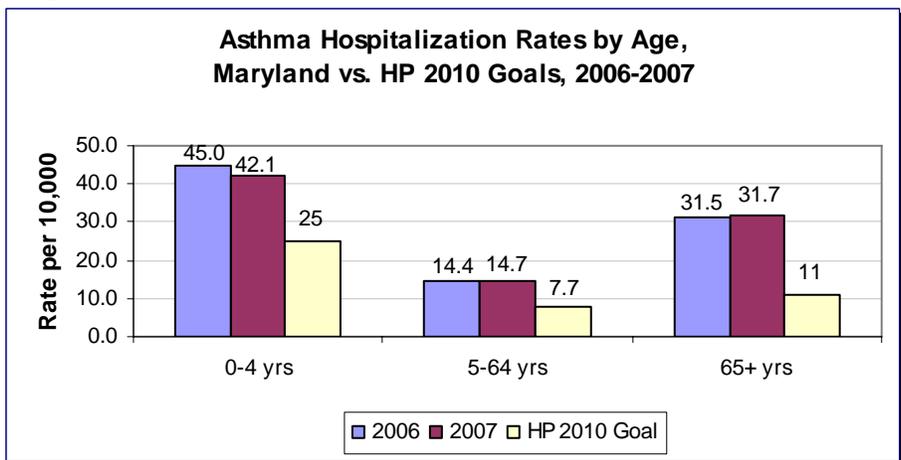


Source: HSCRC hospital discharge data, Maryland Health Care Commission, West Virginia Health Care Authority, Pennsylvania Health Care Cost Containment Council, and Delaware Department of Health, 2005-2007.

Hospitalizations of Maryland residents in West Virginia are included in all data except rates by race, because West Virginia does not collect data on race. Hospitalizations of Maryland residents in the District of Columbia, Pennsylvania, and Delaware are included in all data.

Maryland residents hospitalized for asthma spent a total of 29,412 days in the hospital during 2007, with an average of 3.0 days. Females and Whites stayed longer than their counterparts. The length of hospitalization stay increased with age. While children under the age of 5 years spent an average of 2.0 days in the hospital, adults age 65 and older spent, on average, 4.3 days in the hospital for asthma (figure not included).

Figure 11-4



Source: HSCRC hospital discharge data, Maryland Health Care Commission, West Virginia Health Care Authority, Pennsylvania Health Care Cost Containment Council, and Delaware Department of Health, 2006-2007, Healthy People 2010 Midcourse Review, U.S. Department of Health and Human Services, 2007.

Hospitalizations of Maryland residents in D.C., West Virginia, Pennsylvania, and Delaware are included in 2005 & 2007 data.

MEDICAID ENROLLEES AND 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.

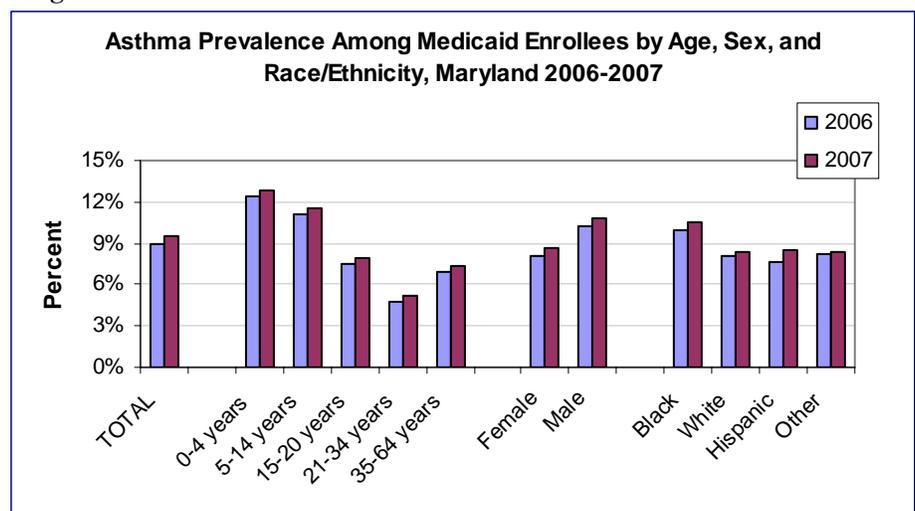
The Maryland Medicaid programs collect claims and encounter data for a variety of purposes including program administration and evaluation, and managed care organization rate-setting. In this report, paid fee-for-service claims and HealthChoice encounters were obtained from Maryland Medicaid administrative dataset for the 2006 and 2007 calendar years. Asthma prevalence, utilization of outpatient care, ED visits, and hospitalizations were analyzed by patient demographics for persons age 0-64 years with asthma. Asthma rates were generated based on principal diagnosis with an ICD-9-CM code of 493.0-493.9 for outpatient and ED visits, and hospitalizations. These data are not representative of the general population, but serve as a proxy for asthma morbidity among the lowest income Maryland residents.

Asthma Prevalence

Asthma prevalence was defined as the percent of Medicaid enrollees having **at least one encounter with a diagnosis of asthma during the calendar year**. Visits can be linked to specific enrollees, so the number of outpatient visits, emergency department visits, and hospitalizations per person can be determined. This is in contrast to hospitalization and emergency department visit data from the Health Services Cost Review Commission (HSCRC), in which visits cannot be matched to individuals. HSCRC data show the number of emergency department visits or hospitalizations, not the percent of individuals with emergency department visits or hospitalizations. This is because HSCRC data are not unduplicated; one individual with two visits would be counted twice.

In 2007, 74,990 Maryland Medicaid enrollees had a diagnosis of asthma. Asthma prevalence for all Medicaid enrollees in 2007 was 9.6%, up from 9.0% in 2006. The comparison of 2006 to 2007 shows increases for persons ages 0-64 years. Asthma prevalence was higher for Blacks than for Whites, and higher for males than females. Asthma prevalence is highest among the youngest children ages 0-4 years, decreases in older children and young adults, and then rises again in older adults.

Figure 12-1

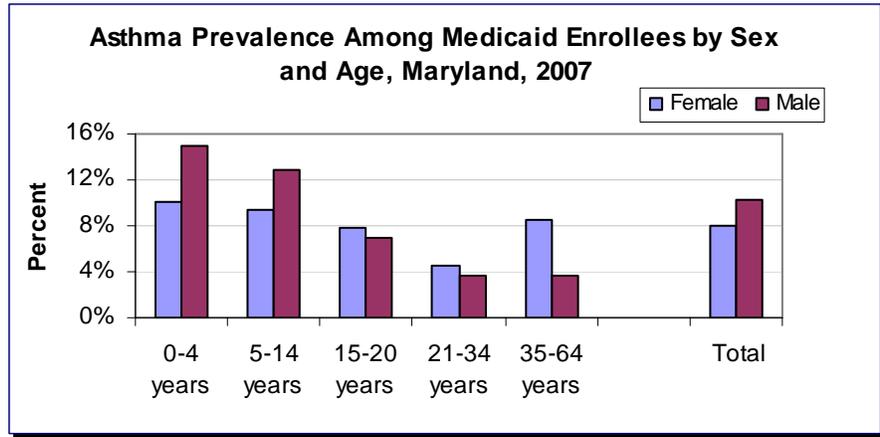


Source: Maryland Medicaid, 2006-2007

MEDICAID ENROLLEES AND ASTHMA - Continued

Comparison by age and sex show higher prevalence among male children ages 0-14 years. From age 15 through age 64, females have a higher prevalence of asthma than males.

Figure 12-2



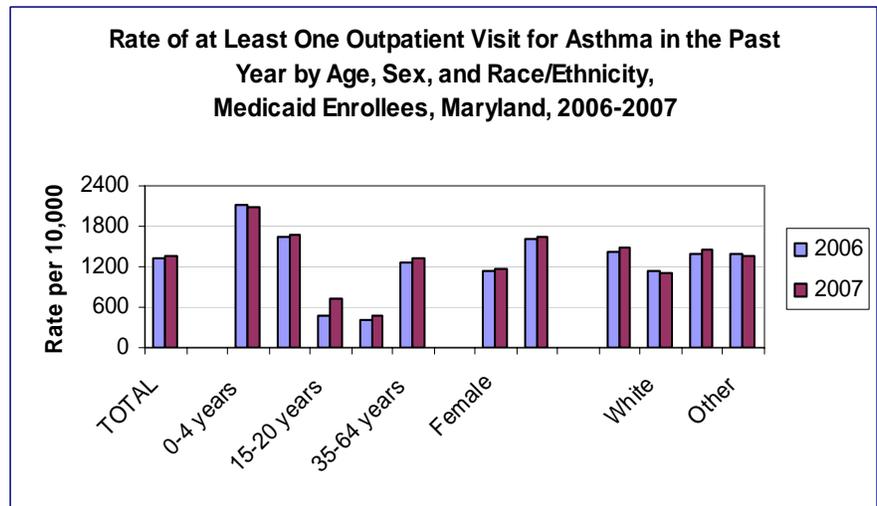
Source: Maryland Medicaid, 2007

Outpatient Visits

About half of Maryland Medicaid enrollees with asthma had an outpatient visit that included a diagnosis of asthma during 2007.

Figure 12-3

Children under 15 years of age were more likely than adolescents and young adults (15-34 years) to have at least one outpatient visit, with 1,841 per 10,000 Medicaid enrollees vs. 594 per 10,000 Medicaid enrollees. Children in this age group had an average of one outpatient asthma visit per child per year. Rates were higher for males than females.



Source: Maryland Medicaid, 2006-2007

Interpretation of this data is challenging for several different reasons. For instance, it is likely that Medicaid enrollees with outpatient visits may have had a higher severity of disease than those who had no outpatient visits. In addition, individuals may have had additional outpatient visits which did not include a diagnosis of asthma; these visits are not counted here. For example, asthma may be addressed during a well-child visit, but not coded as such. Lastly, the level of asthma acuity was not determined.

MEDICAID ENROLLEES AND ASTHMA - Continued

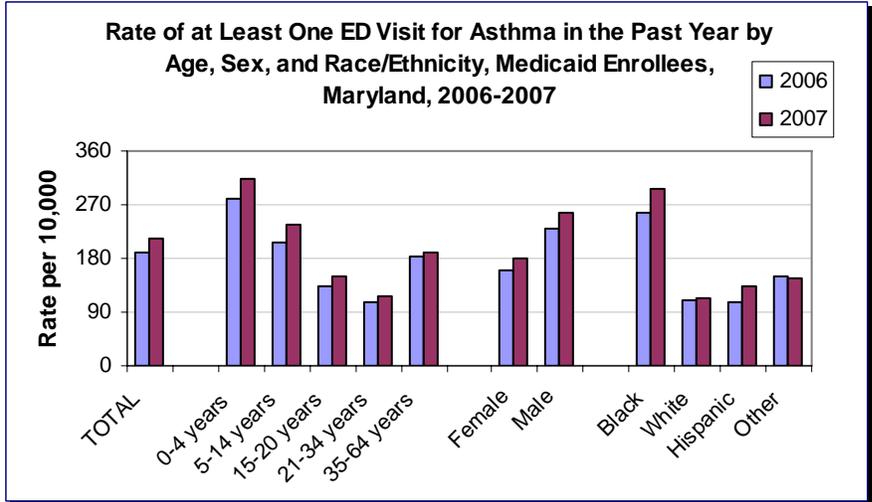
Emergency Department Use

In 2007, approximately 213 per 10,000 Medicaid enrollees had emergency department visits with a principal diagnosis of asthma. This rate is more than three times the Maryland population as a whole (69.8 emergency department visits per 10,000 population).

Emergency department visits with a principal diagnosis of asthma were highest for Medicaid enrollees 0-4 years of age with a rate of 281 per 10,000 Medicaid enrollees. Rates were nearly 2.5 times higher for Blacks than for Whites or Hispanics.

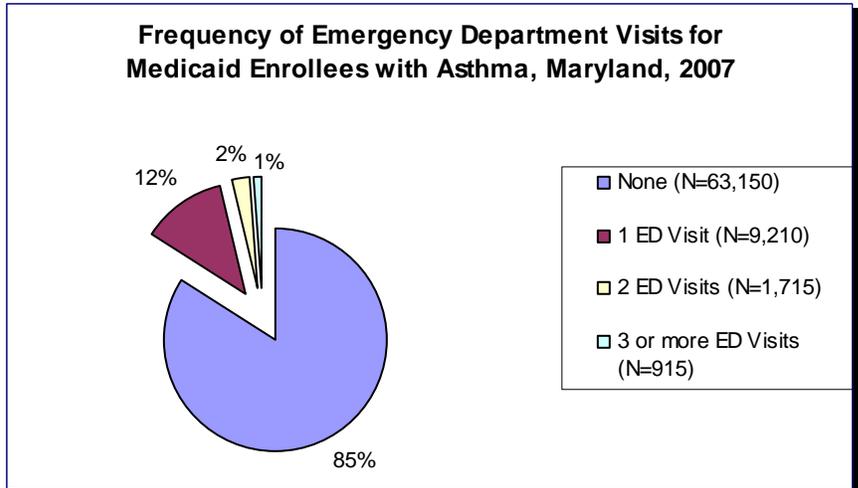
Most Medicaid enrollees with a principal diagnosis of asthma required no emergency department visits in 2007 (63,150 or 84.2%). Twelve percent had one emergency department visit, and 3.5% had two or more visits in 2007.

Figure 12-4



Source: Maryland Medicaid, 2006-2007

Figure 12-5



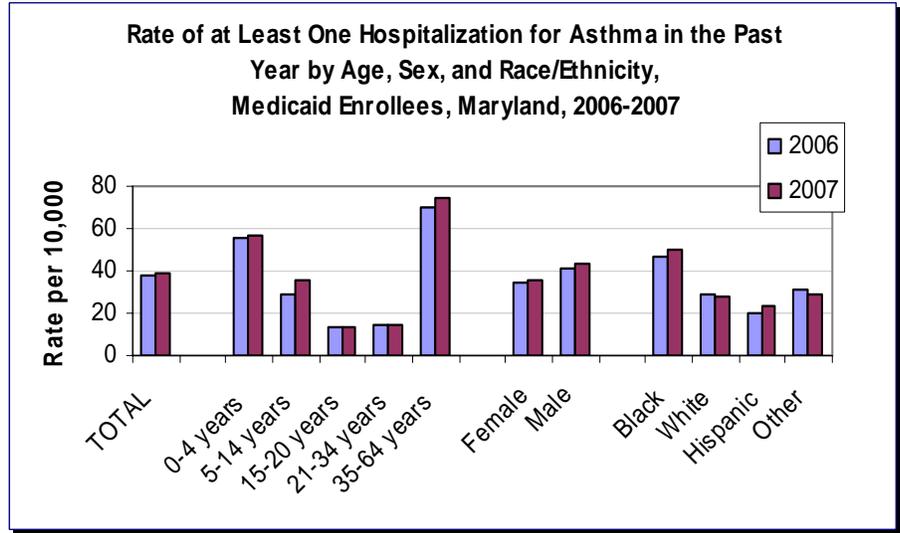
Source: Maryland Medicaid, 2007

MEDICAID ENROLLEES AND ASTHMA - Continued

Hospitalizations

The rate of hospitalization for asthma was 39.7 per 10,000 Medicaid enrollees in 2007. The hospitalization rates among children were highest for enrollees 0-4 years of age (57.2 hospitalizations per 10,000 enrollees). The hospitalization rates among adults were highest for those age 35-64 years (74.2 hospitalizations per 10,000 enrollees). Rates were higher for Blacks than any other racial or ethnic group.

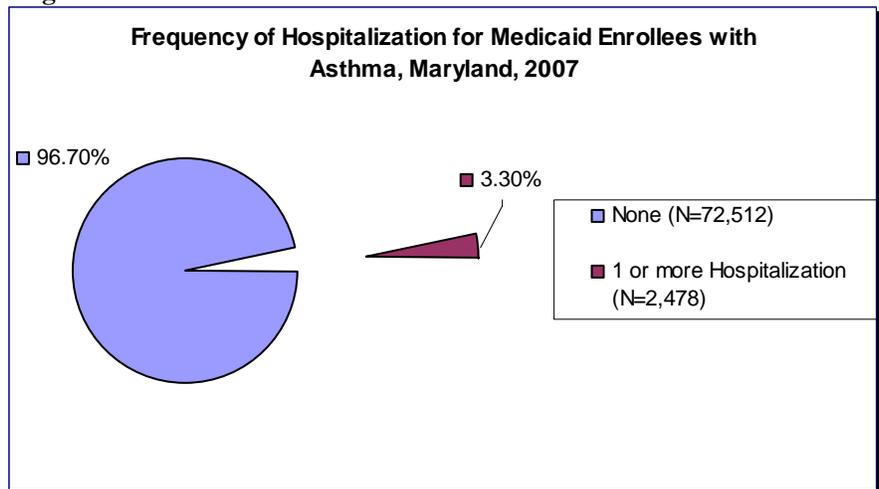
Figure 12-6



Source: Maryland Medicaid, 2006-2007

The overwhelming majority of Medicaid enrollees with asthma had no hospitalization for asthma in 2007. Only 3.3% were hospitalized one or more times.

Figure 12-7



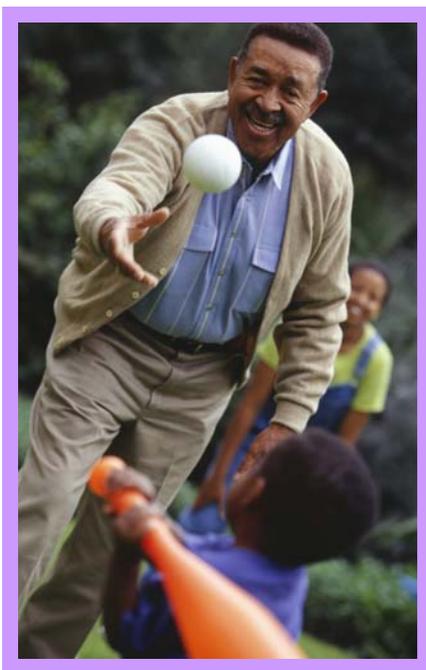
Source: Maryland Medicaid, 2007

DEATHS

Mortality from asthma is potentially preventable. Therefore, to some extent, trends in asthma mortality reflects 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. Until 1998, asthma deaths were defined as having a primary cause of death with an 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 1989-2007 also include out-of-state deaths of Maryland residents. Mortality rates have been age-adjusted to the 2000 U.S. standard population.

In 2007, 73 Maryland residents died from asthma as the underlying cause of death. Asthma contributed to the death of an additional 140 Maryland residents (Table 13-1). Because of the small numbers of deaths each year, five-year averages are calculated and displayed in Figures 13-2 and 13-3.



DEATHS - Continued**Table 13-1 Asthma Deaths Among Maryland Residents, 1989-2007**

Year	Number of Deaths, Asthma as Underlying Cause	Number of Deaths, Asthma as Underlying or Contributing Cause¹
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

Source: Maryland Vital Statistics Administration, 1989-2007

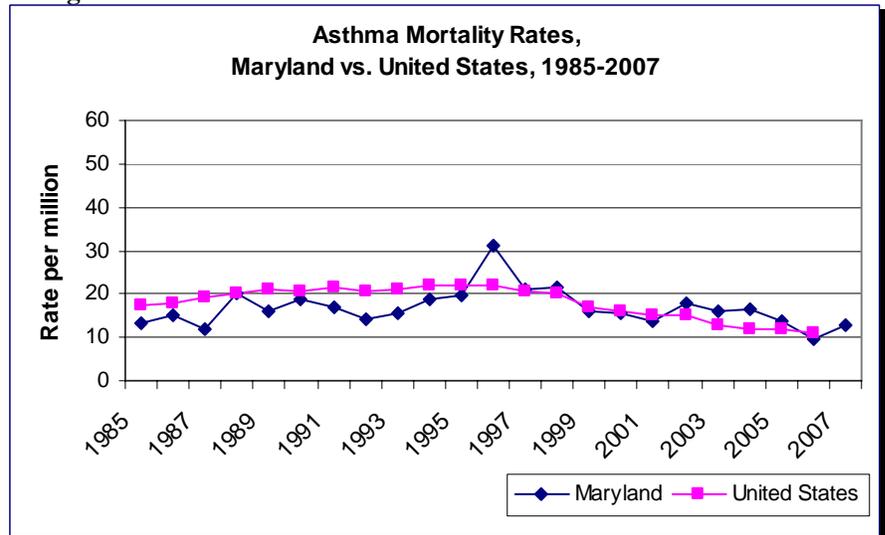
¹ Number of asthma deaths, as underlying or contributing causes, presented in this report may differ from reports prior to 2006 due to revised datasets.

DEATHS - Continued

Mortality rates for Maryland have remained similar to national rates over time. Both Maryland and national mortality rates appeared 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 of death.

The age adjusted mortality rate in 2007 was 13.0 deaths per 1,000,000 population.

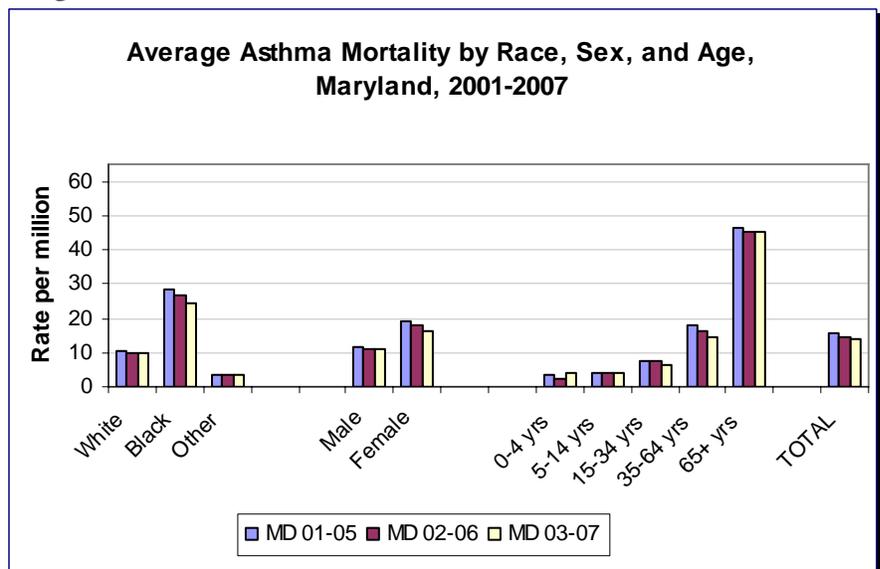
Figure 13-1



Source: Maryland Vital Statistics Administration, 1985-2007, NCHS CDC WONDER Rates are age adjusted to the 2000 U.S. standard population

From 2003-2007, an average of 76.6 Maryland residents died each year from asthma as an underlying cause; a rate of 13.8 deaths per 1,000,000 population. Disparities in asthma mortality continue to exist, both in Maryland and nationally. Blacks continue to die at a rate nearly three times higher than that for Whites (2003-2007 mortality rate of 23.6 vs. 9.4 per 1,000,000, respectively). Women have nearly twice the mortality rate of men (2003-2007 mortality rate of 16.5 vs. 11.0 per 1,000,000, respectively). Asthma mortality rates are highest in the elderly and lowest in children under 15 years of age (2003-2007 mortality rate of 45.5 vs. 3.8 per 1,000,000, respectively).

Figure 13-2

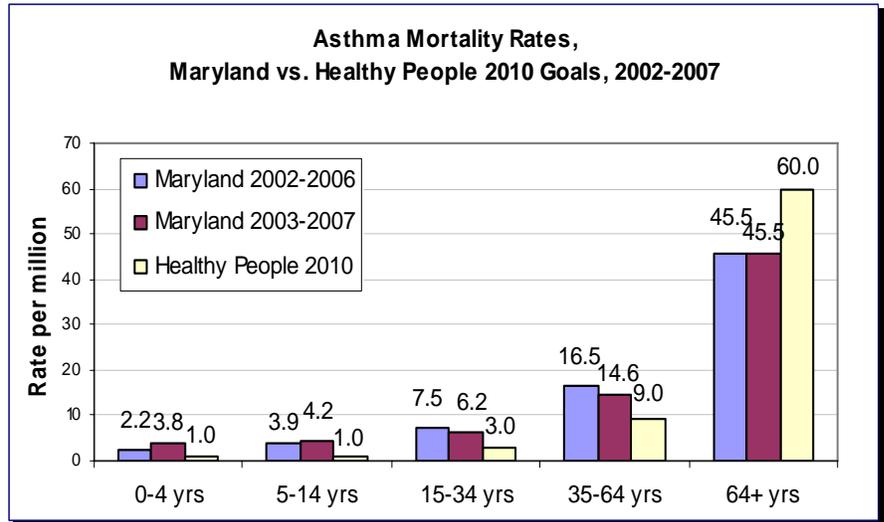


Source: Maryland Vital Statistics Administration, 2001-2007

DEATHS - 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.

Figure 13-3



Source: Maryland Vital Statistics Administration, 2002-2007, Healthy People 2010 Midcourse Review, U.S. Department of Health and Human Services, 2007.

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 many disparities in asthma morbidity and mortality. For example, among Maryland adults, Blacks have a higher asthma prevalence than Whites, and adult women are more likely to have asthma than men. In addition, persons with low income and low educational level are disproportionately burdened by asthma. 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 as compared to older persons with asthma. Blacks have higher asthma mortality rates than Whites.

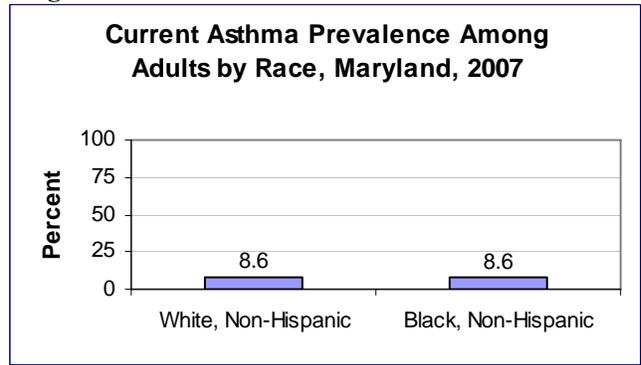
For some groups, increased rates of hospitalization, emergency department visit, and mortality may be a direct result of the increased prevalence of asthma in those groups. For example, if one group had twice the prevalence of asthma, that group might be expected to also have twice the rate of hospitalizations, 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 14-1 through 14-4 provide the rate of hospitalization, ED visits, and mortality for Blacks and Whites. The disparity ratio for these measures are presented in Figure 14-5.



DISPARITIES AND ASTHMA - Continued

The current asthma prevalence was comparable between Black, non-Hispanic adults (8.6%) and White non-Hispanic adults (8.6%).

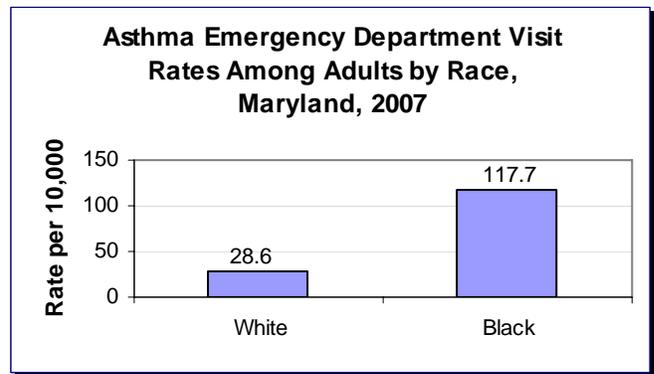
Figure 14-1



Source: Maryland BRFSS, 2007

Black adults in Maryland had a higher rate of emergency department visits than White adults (117.7 vs. 28.6 per 10,000).

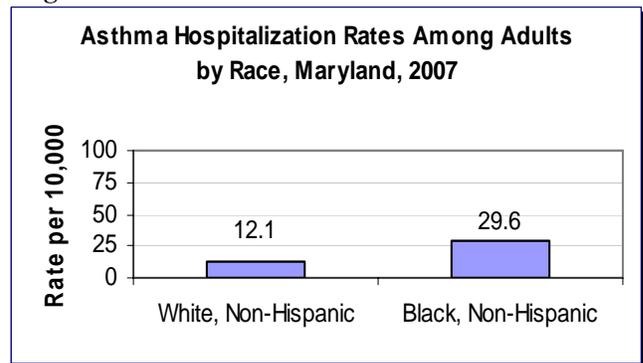
Figure 14-2



Source: HSCRC ambulatory care dataset, 2007
HSCRC does not collect data on ethnicity

Black non-Hispanic adults in Maryland had a higher hospitalization rate than White non-Hispanic adults (29.6 vs. 12.1 hospitalizations per 10,000).

Figure 14-3

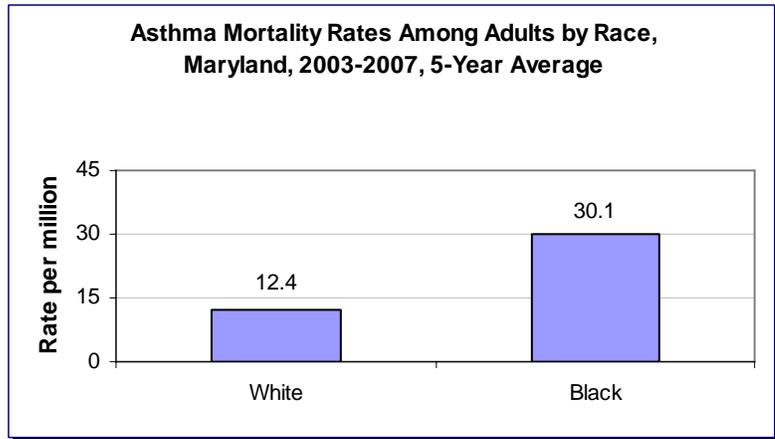


Source: HSCRC hospital discharge dataset, 2007

DISPARITIES AND ASTHMA - Continued

From 2003-2007 (5-year average) black adults in Maryland had a higher mortality rate than White adults (30.1 vs. 12.4 deaths per million).

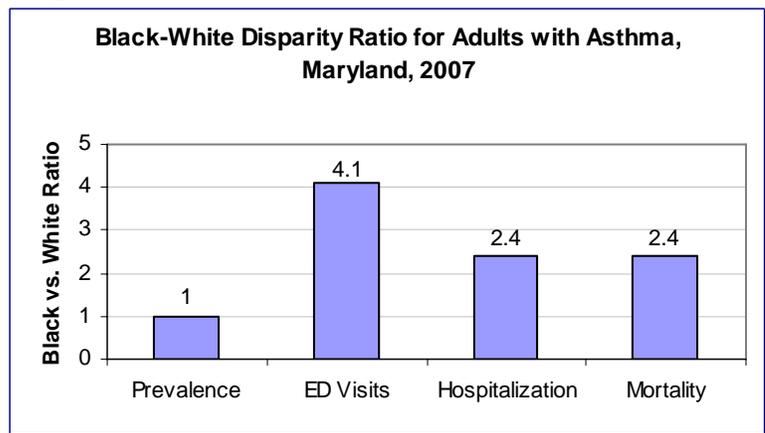
Figure 14-4



Source: Maryland Vital Statistics Administration, 2003-2007

Black adults in Maryland had a 1 to 1 asthma prevalence ratio to White adults (8.6% vs. 8.6%). Yet statistically significantly higher ED, hospitalization and mortality. They had a 4.1 times higher rate of emergency department visits (117.7 vs. 28.6 visits per 10,000), a 2.4 times higher hospitalization rate (29.6 vs. 12.1 hospitalizations per 10,000), and a 2.4 times higher mortality rate (30.1 vs. 12.4 deaths per million).

Figure 14-5



Source: Maryland BRFSS, HSCRC, 2007, Vital Statistics Administration

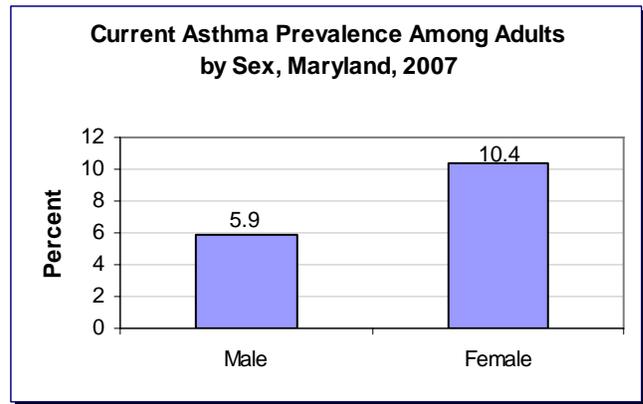
The increased asthma morbidity and mortality among Blacks cannot be explained by prevalence. Other factors, such as higher asthma severity, poorer asthma control, poorer indoor and/or outdoor environment, and/or more limited access to health care may explain these differences. Because of small sample sizes, it was not possible to conduct similar analyses for other minority groups.

DISPARITIES AND ASTHMA - Continued

Adult women consistently have higher prevalence, hospitalization rates, emergency department visit 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, or hormones, or increased health care seeking 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 are presented in Figure 14-10.

Adult women in Maryland had a higher asthma prevalence than adult men (10.4% vs. 5.9%).

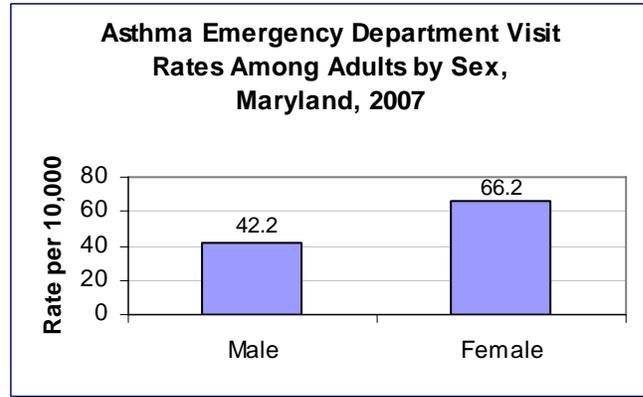
Figure 14-6



Source: Maryland BRFSS, 2007

Adult women in Maryland had a higher rate of emergency department visit than adult men (66.2% vs. 42.2%).

Figure 14-7

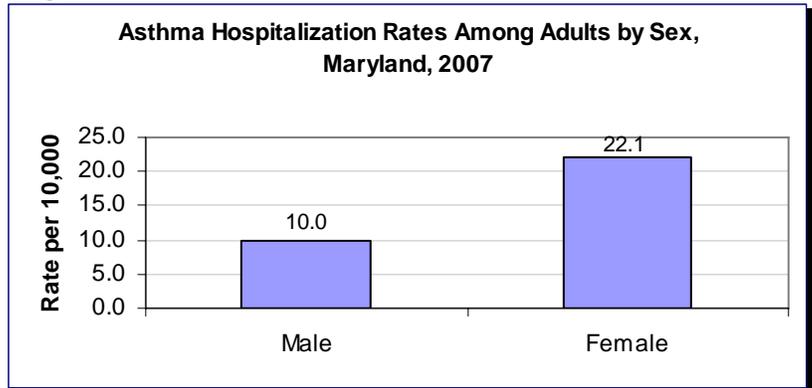


Source: HSCRC ambulatory care dataset, 2007

DISPARITIES AND ASTHMA - Continued

Adult women in Maryland had a higher hospitalization rate than adult men (22.1 vs. 10.0 hospitalizations per 10,000).

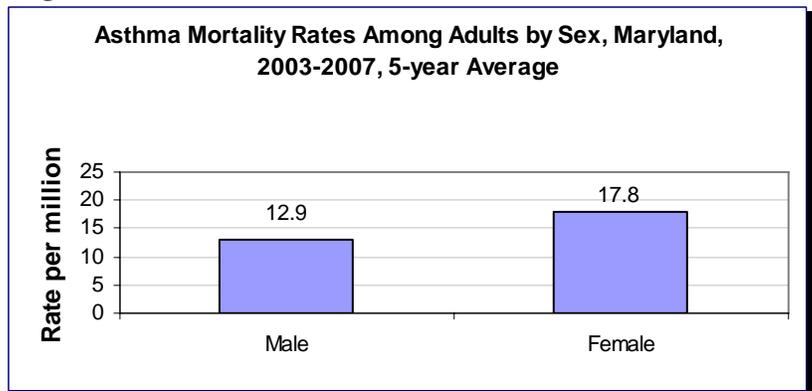
Figure 14-8



Source: HSCRC hospital discharge dataset, 2007

Adult women in Maryland had a higher mortality rate than adult men (17.8 vs. 12.9 deaths per million).

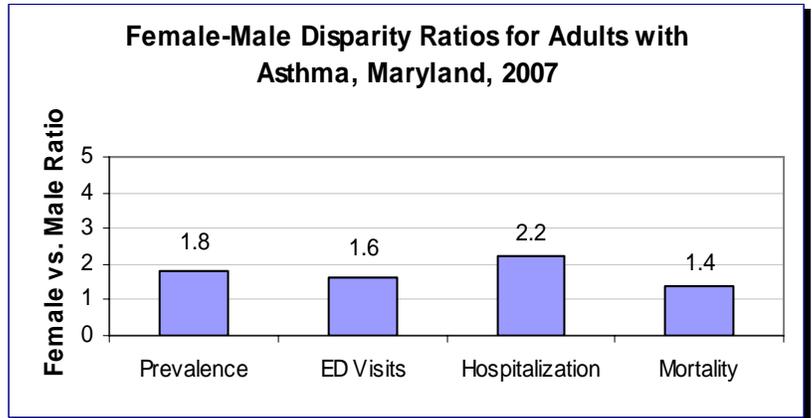
Figure 14-9



Source: Maryland Vital Statistics Administration, 2003-2007

The prevalence of asthma among Maryland women is 1.8 times higher than that among men (10.4% vs. 5.9%). Similarly, women have a 1.6 times higher emergency department visit rate (66.2 vs. 42.2 visits per 10,000) and a 1.4 times higher mortality rate (17.8 vs. 12.9 deaths per million). Therefore, much of the difference in emergency department visit and mortality rates by sex can be explained by the difference in prevalence. Women have a 2.2 times higher hospitalization rate (22.1 vs. 10.0 hospitalizations per 10,000). The difference in hospitalization by sex cannot be fully explained by the prevalence.

Figure 14-10



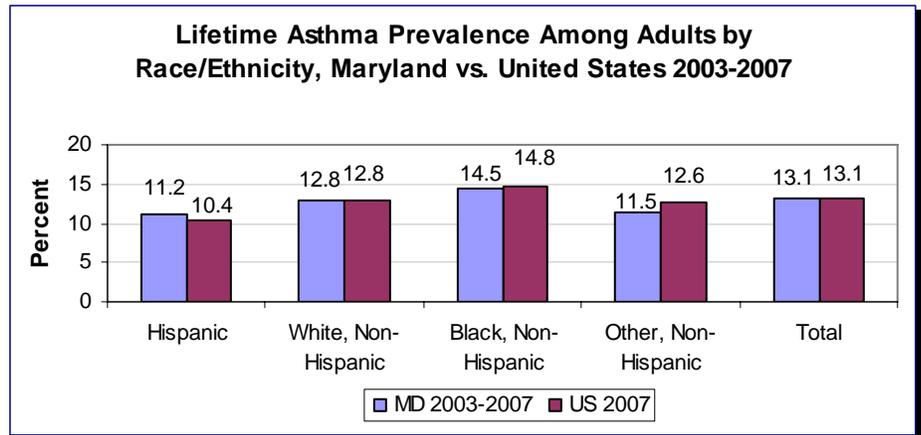
Source: Maryland BRFSS, HSCRC, 2007, Vital Statistics Administration, 2003-2007

ASTHMA AMONG MARYLAND HISPANICS

Data regarding Maryland Hispanics with asthma is somewhat limited. Prevalence data is available from the BRFSS, however, in Maryland the survey is only conducted in English. In 2007, the Maryland BRFSS began administering the survey in Spanish. Nevertheless, small sample size still persisted each year. Consequently, five-year averages are calculated. Hospitalization data is available from the HSCRC. The HSCRC does not collect data on ethnicity for emergency department visits.

Between 2003 and 2007, the lifetime asthma prevalence was comparable between Maryland Hispanics adults and Maryland population as a whole.

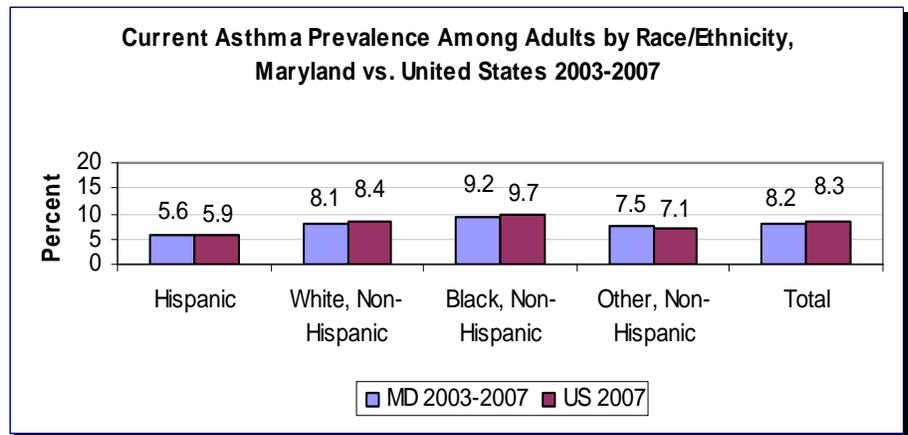
Figure 15-1



Source: Maryland BRFSS, 2003-2007

The average current asthma prevalence among Maryland Hispanic adults was not significantly different to that of the Maryland population as a whole in 2003-2007.

Figure 15-2

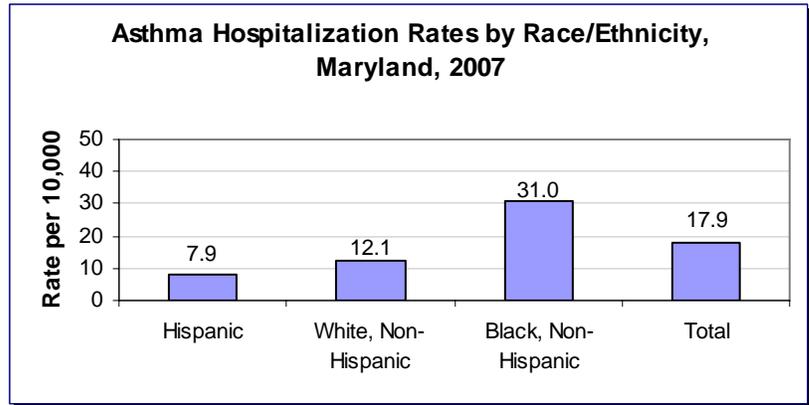


Source: Maryland BRFSS, 2003-2007

ASTHMA AMONG MARYLAND HISPANICS — Continued

Hospitalization rates for Maryland Hispanics are lower than rates for other racial and ethnic groups.

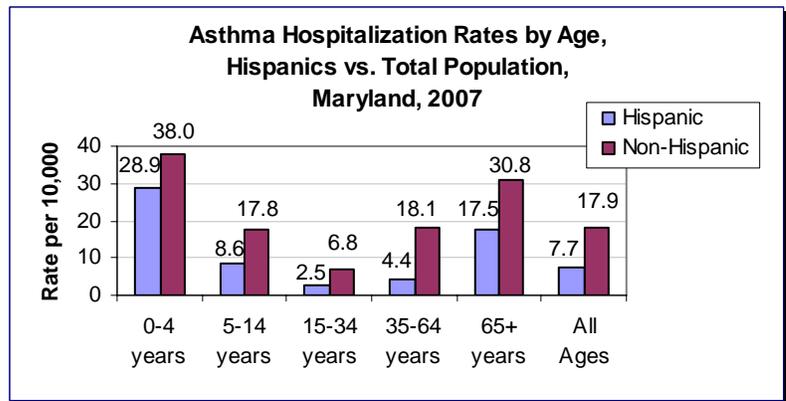
Figure 15-3



Source: HSCRC hospital discharge dataset, 2007
Hospitalization data does not include Maryland asthmatics hospitalized out of state.

Differences in hospitalization rates between Hispanic and non-Hispanic are larger for adults than children.

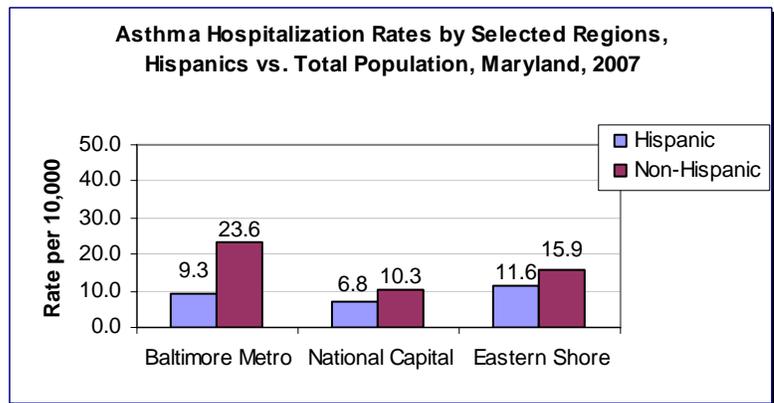
Figure 15-4



Source: HSCRC hospital discharge dataset, 2007
Hospitalization data does not include Maryland asthmatics hospitalized out of state.

Hospitalization rates for Hispanics in the Baltimore Metropolitan Area, the National Capital, and Eastern Shore area are lower than the hospitalization rates for the non-Hispanic population in those areas.

Figure 15-5



Source: HSCRC hospital discharge dataset, 2007
Hospitalization data does not include Maryland asthmatics hospitalized out of state.

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 greater stability of the estimates is obtained when years are combined. As with previous Maryland asthma surveillance reports, three years of data, 2005-2007, 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. Mortality data are presented for 2003-2007. Even when several years of data are combined, there may still be large changes in rates from last year's report for some small 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 2007 only. Hospitalization data includes numbers of Maryland residents hospitalized in neighboring states (Delaware, Pennsylvania, and West Virginia) and the District of Columbia. Data were 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 the following two tables (10-1 and 10-2):

Lifetime and Current Prevalence from BRFSS. Percentages are weighted to the 2007 Maryland population.

Emergency Department and Hospitalization data from HSCRC

Mortality data from Maryland Vital Statistics Administration Five year average provided because of small numbers of deaths per year

All rates are age adjusted to the 2000 U.S. standard population

*Total ED visits includes 11 persons with county of residence unknown

*Total Hospitalizations includes Maryland residents hospitalized in Delaware.

Hospitalization data by county includes Maryland residents hospitalized in D.C., West Virginia, and Pennsylvania. Delaware data not included because Delaware does not collect data on Maryland county of residence.

**Rate significantly different from the State of Maryland rate ($p < 0.05$)

-- Rates with less than 5 events were not displayed

MARYLAND JURISDICTIONS AND ASTHMA - Continued

**Table 16-1: Lifetime and Current Asthma Prevalence, 2005-2007, Three-year average.
Emergency Department Visit and Hospitalization Rates, 2007.
Average Mortality Rate 2003-2007. Data by Region and Jurisdiction**

Jurisdiction	Lifetime Prevalence 2005-2007 Weighted Percent (95% CI)	Current Prevalence 2005-2007 Weighted Percent (95% CI)	ED Visits 2007 (Rate per 10,000)	Hospitalizations 2007 (Rate per 10,000)	Average Mortality 2003-2007 (Rate per 1,000,000)
NORTHWEST			48.5 **	15.6	13.8
Garrett	8.3 (5.5-11.1)	6.2 (3.8-8.6)	61.1 **	10.0 **	--
Allegany	11.6 (8.8-14.4)	8.2 (5.8-10.6)	90.9	29.7 **	--
Washington	13.5 (11.2-15.8)	8.5 (6.6-10.4)	50.8 **	11.9 **	23.8
Frederick	11.9 (10.0-13.8)	7.7 (6.2-9.2)	31.3 **	13.9	12.0
BALTIMORE METRO			108.9 **	23.3 **	15.9
Baltimore City	16.1 (14.0-18.3)	11.1 (9.3-12.9)	230.5 **	45.6 **	34.1 **
Baltimore County	12.9 (11.4-14.4)	8.3 (7.1-9.5)	92.4 **	20.7	14.6
Anne Arundel	12.3 (10.4-14.2)	7.8 (6.3-9.3)	62.1 **	14.9 **	7.9
Carroll	15.0 (11.7-18.3)	10.3 (7.5-13.1)	35.0 **	15.7	7.5
Howard	9.9 (7.7-12.2)	6.1 (4.3-7.9)	58.8 **	6.0 **	5.8
Harford	15.7 (12.8-18.6)	10.5 (8.1-13.0)	51.3 **	18.6	5.4
NATIONAL CAPITOL			48.6 **	12.9 **	12.1
Montgomery	12.4 (11.1-13.7)	7.7 (6.6-8.8)	36.7 **	9.4 **	10.1
Prince George's	13.6 (11.8-15.4)	8.7 (7.2-10.2)	61.7 **	17.3	14.2
SOUTHERN MD			52.2 **	15.5	12.7
Calvert	10.7 (7.8-13.6)	7.3 (4.8-9.8)	49.9 **	15.7	15.4
Charles	14.8 (12.0-17.6)	8.1 (5.9-10.3)	51.7 **	13.1 **	11.9
Saint Mary's	10.1 (7.5-12.7)	7.1 (4.9-9.3)	54.8 **	18.7	11.5
EASTERN SHORE			73.2 **	16.4	9.9
Cecil	14.3 (11.4-17.2)	8.8 (6.5-11.2)	45.5 **	28.7 **	14.9
Kent	11.0 (7.1-14.9)	7.6 (4.3-10.9)	76.1	21.4	--
Queen Anne's	12.7 (9.6-15.8)	8.4 (5.8-11.0)	40.5 **	10.1 **	--
Caroline	12.3 (8.6-16.0)	8.1 (5.0-11.2)	52.6 **	17.2	--
Talbot	10.8 (7.9-13.7)	6.5 (4.2-8.8)	64.8	11.5 **	--
Dorchester	21.1 (16.6-25.6)	12.0 (8.4-15.6)	114.4 **	21.6	--
Wicomico	13.0 (10.2-15.8)	9.8 (7.3-12.3)	92.9 **	12.7 **	10.9
Somerset	16.1 (10.7-21.5)	13.8 (8.7-18.9)	118.6 **	13.2	--
Worcester	11.8 (8.4-15.2)	7.8 (5.0-10.6)	98.4 **	7.8 **	--
TOTAL	13.1 (12.6-13.6)	8.5 (8.1-8.9)	78.7	18.5	13.8

MARYLAND JURISDICTIONS AND ASTHMA - Continued

Table 16-2: Number of Residents with Lifetime and Current Asthma Prevalence, 2005-2007, Three-year Average. Total Number of Emergency Department Visits and Hospitalizations, 2007. Average Number of Deaths, 2003-2007. Data by Region and Jurisdiction.

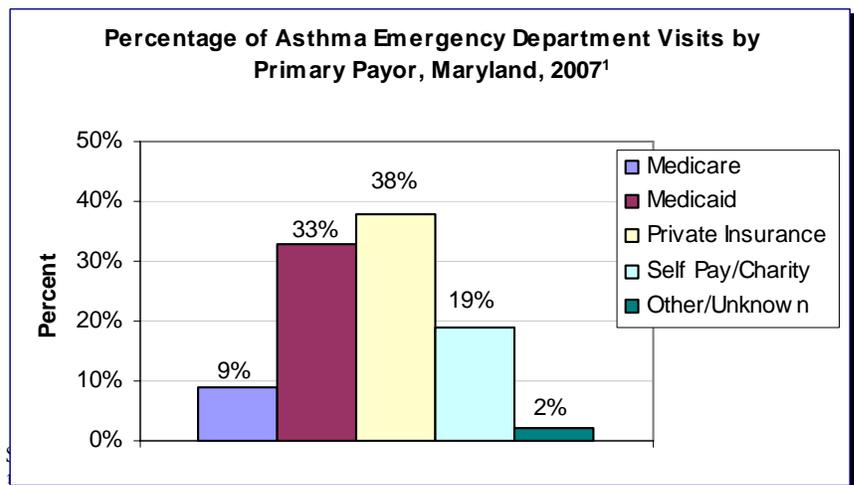
Jurisdiction	Number of Residents Who Ever Had Asthma Ave. 2005-07	Number of Residents Who Currently Have Asthma Ave. 2005-07	Number of Emergency Department Visits 2007	Number of Hospitalizations 2007	Average Number of Deaths per Year 2003-2007
NORTHWEST			2,240	746	6.6
Garrett	2,447	1,798	172	37	<1
Allegany	6,920	4,862	651	240	<1
Washington	15,243	9,623	709	168	3.6
Frederick	19,550	12,680	709	301	2.2
BALTIMORE METRO			27,582	6,155	41.2
Baltimore City	66,416	45,282	14,463	2,900	21.8
Baltimore County	80,246	51,638	6,705	1,634	12.4
Anne Arundel	45,668	28,616	3,094	775	3.2
Carroll	20,520	14,019	566	263	1.2
Howard	22,761	14,014	1,565	153	1.4
Harford	30,284	20,196	1,194	438	1.2
NATIONAL CAPITOL			8,421	2,265	20.0
Montgomery	92,770	57,150	3,284	880	9.2
Prince George's	77,994	49,972	5,140	1385	10.8
SOUTHERN MD			1,731	491	3.4
Calvert	6,436	4,376	430	134	1.2
Charles	15,034	8,196	737	174	1.2
Saint Mary's	7,883	5,503	564	183	1.0
EASTERN SHORE			3,101	737	4.6
Cecil	11,427	7,000	449	280	1.4
Kent	1,776	1,231	150	45	<1
Queen Anne's	4,197	2,732	184	49	<1
Caroline	3,099	2,054	169	58	<1
Talbot	3,302	1,975	218	47	<1
Dorchester	4,887	2,786	327	73	<1
Wicomico	9,274	7,022	853	118	1.0
Somerset	2,229	1,907	299	30	<1
Worcester	4,556	3,011	453	37	<1
TOTAL	554,921	357,644	43,096*	10,402*	81.2

COSTS OF ASTHMA

The financial burden of asthma in Maryland is substantial. While data is not available for all costs related to asthma care, the HSCRC does provide information about charges for asthma hospitalization and emergency department visits. The data below use charges as an estimate of the actual costs of asthma hospitalizations and emergency department visits. Total charges for asthma hospitalizations in 2007 were \$62,123,053. Emergency department visits accounted for an additional \$31,651,383. The average charge for an inpatient stay for asthma in 2007 was \$6,345. The average charge for an emergency department visit for asthma was \$734.

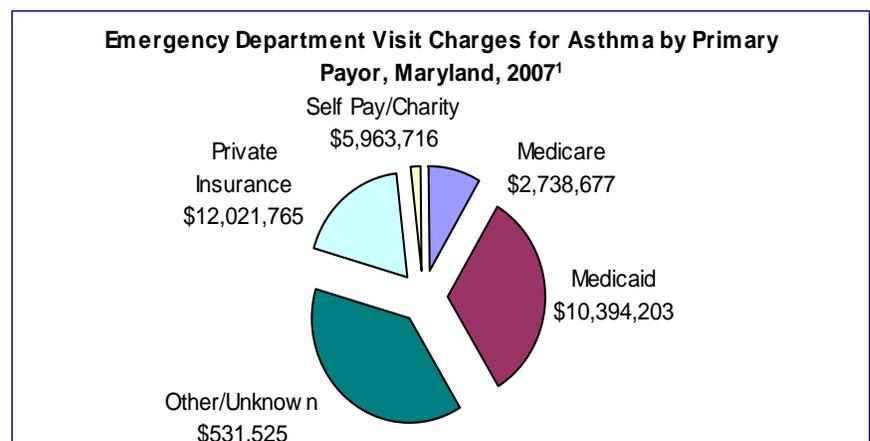
In 2007, a larger percentage of ED visits were covered by public insurance, including Medicare and Medicaid, when compared to private insurance.

Figure 17-1



comparable to 2007 and beyond; and as such, are not included in display.

Figure 17-2



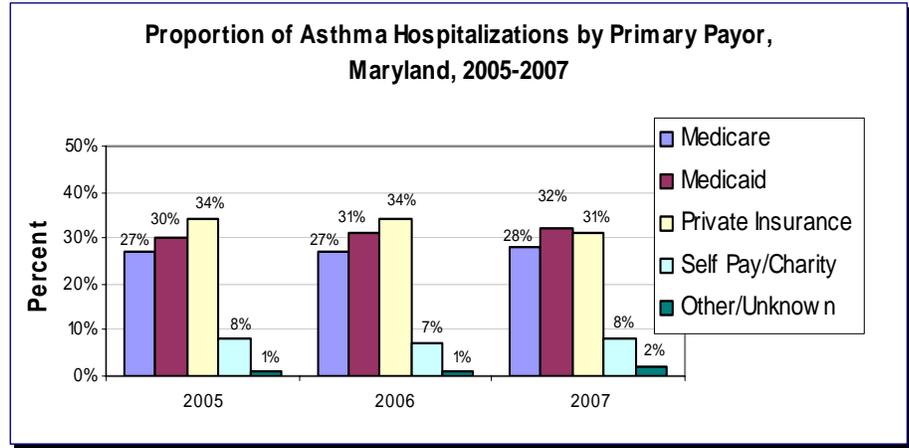
Source: HSCRC ambulatory care data, 2007

¹ Data collection methodology changed in July of 2007. ED visits prior to 2007 are not comparable to 2007 and beyond; and as such, are not included in display.

COSTS OF ASTHMA - Continued

Between 2005 and 2007, private insurance was the source of payment for 31% of asthma hospital discharges in Maryland. Public insurance, including Medicaid and Medicare, were the payment source of approximately 60% of asthma hospital discharges in 2007.

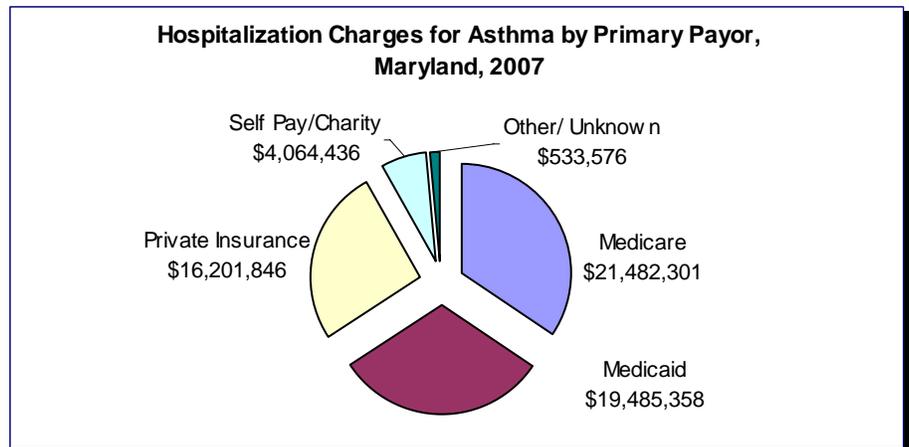
Figure 17-3



Source: HSCRC hospital discharge data, 2005-2007

In 2007, private insurance incurred 26% of the total asthma hospitalization costs. Public insurance, on the other hand, incurred approximately 66% of the total hospitalizations. Of the total public insurance cost, Medicaid acquired 48% of the costs.

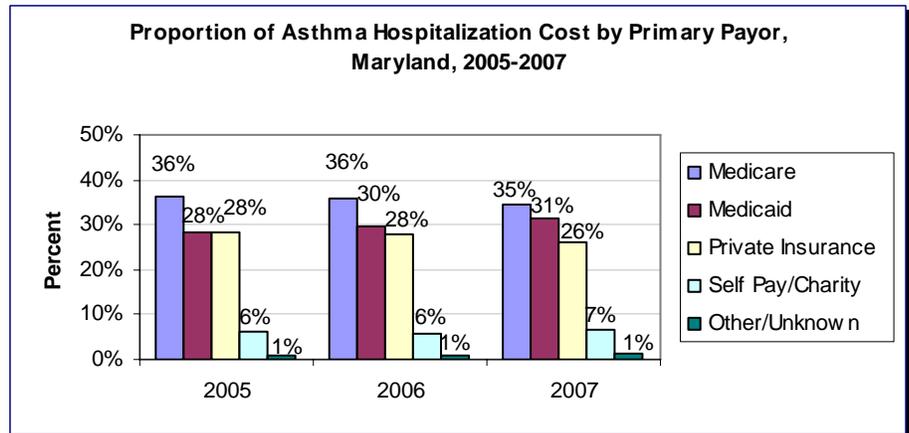
Figure 17-4



Source: HSCRC hospital discharge data, 2005-2007

Between 2005 and 2007, the percentage of asthma hospitalization costs paid for by private insurance decreased, while the percentage covered by public insurance increased.

Figure 17-5



Source: HSCRC hospital discharge data, 2005-2007

CONCLUSIONS

This report confirms that asthma continues to be a major public health problem in Maryland. An estimated 12.9% of Maryland adults and 13.6% of Maryland children have been diagnosed with asthma. An estimated 8.3% of adults and 8.9% of children in Maryland currently have asthma. These prevalence rates decreased in 2007.

The 2006-2008 Maryland Asthma Callback Survey allows the first look at asthma control and management, asthma self-management education, 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 25% of adults and 41% of children missing at least a day of school/work due to their asthma. In addition, the 2006-2008 Maryland Asthma Callback Survey also provides a first look at the prevalence of work-related asthma and comorbid chronic conditions among Maryland adults who have asthma. More than one-third of all adults with asthma report that their asthma was caused or made worse by a job that had held. Approximately one-third of adults with asthma also report a diagnosis of COPD and/or depression.

Hospitalization rates decreased for Whites and children under the age of 5 years, but also increased slightly for all other groups. Asthma prevalence, hospitalization rates, emergency department visit rates, and mortality rates still remain well above the Healthy People 2010 goals.

As indicated in the chapters on disparities and on Medicaid enrollees, asthma and its complications continue to disproportionately affect the very young, the elderly, Blacks, low-income individuals, and individuals in certain jurisdictions, particularly Baltimore City. The monetary cost of asthma hospitalizations and emergency department visits is substantial, and are increasingly borne by Medicare and Medicaid. Additional tracking of asthma prevalence, morbidity and mortality is vital to improve understanding of individual and environmental contributing factors. Information gleaned 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. Because 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 through ongoing surveillance activities.



FUTURE DIRECTIONS

The Maryland Asthma Control Program (MACP) expects to 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. Efforts are also underway to assess the burden of asthma among the privately insured population as well as Marylanders in school, child care and workplace settings. MACP is spearheading a Surveillance Workgroup that will identify additional data sources and recommend ways to ensure consistency and clarity of data presentation. Finally, 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.

Average Mortality Rate –

The average number of people dying from a disease within a specified time period

~~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. For example, 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. www.healthypeople.gov.

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

ICD-10 – International Classification of Disease, 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

Level of Acuity – An assessment of the urgency of the visit. For example, from the Medicaid outpatient claims data, a person is unable to determine whether the outpatient visit was for a routine asthma check, an urgent care visit for asthma exacerbation, or a follow-up visit after an asthma exacerbation.

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 has 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.

Rate =

Number of events in a given time period

Number of people at risk of experiencing the event in that same time period

Rates are typically presented and interpreted per unit of population (e.g., 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).

GLOSSARY OF TERMS - Continued

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 the results to be generalized to the larger population that the sample was drawn from.

Acronyms

BRFSS	Behavioral Risk Factor Surveillance System
CDC	United States Centers for Disease Control and Prevention
CI	Confidence Interval
ED	Emergency Department
HSCRC	Health Services Cost Review Commission
ICD	International Classification of Disease
NCHS	National Center for Health Statistics
WONDER	Wide-ranging Online Data for Epidemiologic Research

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, 2000-2007

Year	Maryland Prevalence (95% CI)	U.S. Prevalence (95% CI)
2000	10.6% (9.5%-11.7%)	10.6% (NA)
2001	11.1% (10.0%-12.2%)	11.2% (NA)
2002	12.7% (11.5%-13.9%)	11.8% (NA)
2003	12.3% (11.1%-13.5%)	11.7% (11.5%-11.9%)
2004	13.9% (12.7%-15.2%)	13.3% (13.1%-13.6%)
2005	13.1% (12.2%-14.0%)	12.6% (12.4%-12.9%)
2006	13.4% (12.5%-14.3%)	13.0% (12.8%-13.3%)
2007	12.9% (12.0%-13.8%)	13.1% (12.7%-13.2%)

Figure 1-2: Trend in Current Asthma Prevalence Among Adults, Maryland vs. United States, 2000-2007

Year	Maryland Prevalence (95% CI)	U.S. Prevalence (95% CI)
2000	7.3% (6.4%-8.2%)	7.3% (NA)
2001	7.1% (6.2%-8.0%)	7.3% (NA)
2002	8.2% (7.2%-9.2%)	7.6% (NA)
2003	7.8% (6.8%-8.8%)	7.6% (7.5%-7.7%)
2004	7.8% (6.8%-8.8%)	8.3% (8.1%-8.5%)
2005	8.3% (7.6%-9.0%)	8.0% (7.8%-8.2%)
2006	8.9% (8.2%-9.6%)	8.4% (8.1%-8.7%)
2007	8.3% (7.6%-9.0%)	8.3% (8.1%-8.4%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 1-3: Age at Initial Asthma Diagnosis for Adults, Maryland, 2006-2008 Combined (Raw sample size = 1,364)

Age	Prevalence (95% CI)
< 10 years	38.7% (28.3%-40.9%)
11-17 years	14.1% (10.7%-17.5%)
18-34 years	19.8% (16.9%-22.6%)
35-44 years	11.4% (9.2%-13.6%)
45-54 years	7.9% (6.3%-9.5%)
55-64 years	4.7% (3.5%-5.9%)
65+ years	3.4% (2.5%-4.4%)

Figure 1-4: Current Asthma Prevalence Among Adults by Sex, Maryland, 2005-2007 Combined (Raw sample size = 2,253)

Sex	Prevalence (95% CI)
Male	6.4% (5.8%-7.0%)
Female	10.4% (9.8%-11.0%)

Figure 1-5: Current Asthma Prevalence Among Adults by Race/Ethnicity, Maryland, 2005-2007 Combined (Raw sample size = 2,222)

Race/Ethnicity	Prevalence (95% CI)
White, Non-Hispanic	8.2% (7.7%-8.7%)
Black, Non-Hispanic	9.5% (8.4%-10.6%)
Hispanic	5.7% (3.5%-7.9%)
Other, Non-Hispanic	8.5% (6.2%-10.8%)
Multi-race, Non-Hispanic	14.8% (9.2%-20.4%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 1-6: Current Asthma Prevalence Among Adults by Age, Maryland, 2005-2007 Combined (Raw sample size = 2,221)

Age	Prevalence (95% CI)
18-24 years	10.9% (8.6% - 13.2%)
25-34 years	8.5% (7.3% - 9.7%)
35-44 years	8.1% (7.2% - 9.1%)
45-54 years	8.9% (8.0% - 9.8%)
55-64 years	8.2% (7.3% - 9.1%)
65-74 years	8.5% (7.4% - 9.6%)
75+ years	6.0% (5.0% - 7.1%)

Figure 1-7: Current Asthma Prevalence Among Adults by Education Level, Maryland, 2005-2007 Combined (Raw sample size = 2,251)

Education Level	Prevalence (95% CI)
Less than High School Graduate	10.6% (8.8% - 12.4%)
High School Graduate/GED	9.4% (8.6% - 10.2%)
Some College/Technical School	9.3% (8.4% - 10.2%)
College Graduate	7.3% (6.7% - 7.9%)

Figure 1-8: Current Asthma Prevalence Among Adults by Household Income, Maryland, 2005-2007 Combined (Raw sample size = 1,934)

Income	Prevalence (95% CI)
<\$15,000	14.9% (12.8% - 17.0%)
\$15,000-\$24,999	11.0% (9.5% - 12.5%)
\$25,000-\$49,999	8.1% (7.2% - 9.0%)
\$50,000-\$74,999	7.3% (6.3% - 8.3%)
>=\$75,000	7.5% (6.8% - 8.2%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 1-9: Trend in Lifetime Asthma Prevalence Among Children Ages 0-17, Maryland, 2001-2007

Year	Maryland Prevalence (95% Confidence Interval)
2001	10.6% (NA)
2002	11.0% (NA)
2003	11.1% (NA)
2004	10.2% (NA)
2005	13.5% (11.3%-15.7%)
2006	13.1% (11.5%-14.7%)
2007	13.6% (11.9%-15.3%)

Figure 1-10: Trend in Current Asthma Prevalence Among Children Ages 0-17, Maryland, 2003-2007

Year	Maryland Prevalence (95% CI)
2003	8.6% (NA)
2004	7.6% (NA)
2005	9.2% (7.3%-11.1%)
2006	9.1% (7.8%-10.4%)
2007	8.9% (7.5%-10.3%)

Figure 1-11: Current Asthma Prevalence Among Children Ages 0-17 by Sex, Maryland, 2005-2007 Combined (Raw sample size = 593)

Sex	Prevalence (95% CI)
Male	10.0% (8.8-11.3%)
Female	8.2% (7.0%-9.4%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 1-12: Current Asthma Prevalence Among Children Ages 0-17 by Race/Ethnicity, Maryland, 2005-2007 Combined (Raw sample size =575)

Race/Ethnicity	Prevalence (95% CI)
White, Non-Hispanic	7.3% (6.4%-8.2%)
Black, Non-Hispanic	11.6% (9.3%-13.9%)
Hispanic	8.8% (5.0%-12.6%)
Asian, Non-Hispanic	6.9% (2.5%-11.3%)
Other, Non-Hispanic	14.5% (5.4%-23.6%)

Figure 1-13: Current Asthma Prevalence Among Children Ages 0-17 by Age, Maryland, 2005-2007 Combined (Raw sample = 568)

Age	Maryland Prevalence (95% CI)
< 2 years	3.0% (1.4%-4.6%)
2-5 years	9.5% (9.5%-11.6%)
6-11 years	9.7% (8.0%-11.4%)
12-17 years	10.4% (8.9%-11.9%)

Figure 2-1: Asthma Status of Adult Smokers, Maryland, 2005-2007 (Raw sample size = 26,082)

Smoking Category	% With Current Asthma (95% CI)	% With Past Asthma (95% CI)	% Never Had Asthma (95% CI)
Current Smoker-Daily	9.6% (8.4%-10.8%)	5.0% (4.1%-5.9%)	85.4% (83.9%-86.9%)
Current Smoker-Some	11.0% (8.8%-13.2%)	4.7% (3.2%-6.2%)	84.3% (81.7%-86.9%)
Former Smoker	8.8% (8.0%-9.6%)	4.7% (4.1%-5.3%)	86.6% (85.7%-87.6%)
Never Smoked	8.0% (7.5%-8.6%)	3.8% (3.4%-4.2%)	88.2% (87.6%-88.9%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 2-2: Smoking Status of Adults with Asthma, Maryland, 2005-2007
(Raw sample size = 26,082)

Asthma Status	% Current Daily Smokers	% Current Smokers- Some Days	% Former Smokers	% Never Smoked
Current Asthma	14.1% (12.3%-15.9%)	6.8% (5.5%-8.1%)	23.7% (21.6%-25.9%)	55.4% (52.9%-57.9%)
Past Asthma	15.0% (12.2%-17.8%)	5.9% (4.1%-7.7%)	25.7% (22.3%-29.1%)	53.4% (49.6%-57.3%)
Never Had Asthma	12.3% (11.8%-12.8%)	5.0% (4.7%-5.4%)	22.9% (22.2%-23.6%)	59.8% (59.0%-60.6%)

Figure 2-3: Percent of Adults Receiving Influenza Vaccination by Current History of Asthma, Maryland, 2007

	Flu Shot in the Past Year	
	% YES (95% CI)	% NO (95% CI)
Current Asthma	50.4% (46.1%-54.7%)	49.6% (45.3%-53.9%)
Past Asthma	40.7% (34.5%-47.0%)	59.3% (53.1%-65.6%)
Never Had Asthma	37.9% (36.6%-39.2%)	62.1% (60.8%-63.4%)

Figure 2-4: Percent of Children Ages 0-17 with Asthma Who Received Influenza Vaccination, Maryland, 2006-2008 Combined (Raw sample size = 386)

	Flu Shot in the Past Year	
	% YES (95% CI)	% NO (95% CI)
Current Asthma	48.0% (41.6%-54.7%)	52.0% (45.5%-58.4%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 3-1: Most Recent Asthma Symptoms Among Adults and Children, Maryland, 2006-2008 Combined
 (Raw sample size: Adults = 1,337; Children = 384)

	Most Recent Asthma Symptoms in the Past Year	
	Adults (95% CI)	Children (95% CI)
<1 week ago	27.6% (24.0%-31.1%)	19.6% (13.9%-25.3%)
1 week - <3 months ago	19.5% (16.6%-22.5%)	31.5% (25.6%-37.5%)
3 months - <1 year ago	14.2% (11.7%-16.8%)	17.9% (13.4%-22.5%)
≥1 year ago	38.4% (34.0%-42.7%)	29.0% (23.5%-34.6%)
Never	0.28% (0.00%-0.57%)	1.0% (0.00%-4.0%)

Figure 3-2: Frequency of Asthma Symptoms Among Adults and Children in the Past Month, Maryland, 2006-2008 Combined
 Raw sample size: Adults = 1,351; Children = 387)

	Most Recent Asthma Symptoms in the Past Month	
	Adults (95% CI)	Children (95% CI)
1-2 days	6.7% (5.0%-8.5%)	11.4% (7.1%-15.7%)
3-5 days	10.4% (8.2%-12.6%)	12.3% (7.8%-16.8%)
6-10 days	6.3% (4.3%-8.3%)	8.5% (4.3%-12.7%)
11-29 days	10.2% (7.6%-12.9%)	4.7% (2.3%-7.0%)
Everyday	8.2% (6.6%-9.7%)	3.2% (0.75%-5.7%)
Never	5.7% (4.2%-7.2%)	11.4% (7.3%-15.5%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 3-3: Most Recent Asthma Medication Among Adults and Children, Maryland, 2006-2008 Combined
 (Raw sample size: Adults = 1,356; Children = 390)

	Most Recent Asthma Medication	
	Adults (95% CI)	Children (95% CI)
<1 week ago	37.7% (33.9%-41.5%)	37.0% (30.6%-43.4%)
1 week - <3 months ago	8.9% (6.9%-10.9%)	19.4% (14.5%-24.3%)
3 months - <1 year ago	8.9% (6.9%-11.0%)	11.6% (8.1%-15.2%)
≥1 year ago	41.5% (37.2%-45.7%)	28.7% (23.1%-34.3%)
Never	2.9% (1.7%-4.2%)	3.3% (0.53%-6.1%)

Figure 3-4: Number of Persons Who Experienced an Asthma Attack in the Past Year, Maryland 2006-2008 Combined
 (Raw sample size: Adults = 924; Children = 390)

	Number of Persons Who Experienced an Asthma Attack in the Past Year
	Prevalence (95% CI)
< 10 years	21.1% (15.9%-26.2%)
10-17 years	19.3% (14.2%-24.4%)
18-34 years	9.5% (5.9%-13.1%)
35-44 years	8.1% (5.8%-10.5%)
45-54 years	8.7% (6.5%-10.8%)
55-64 years	4.8% (3.4%-6.2%)
65+ years	4.5% (3.0%-5.9%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 3-5: Number of Nights with Asthma-related Sleeping Difficulty in the Past Month, Maryland, 2006-2008 Combined
 (Raw sample size: Adults = 1,346; Children = 386)

	Number of Nights with Asthma-related Sleep Difficulty in the Past Month	
	Adults (95% CI)	Children (95% CI)
1-2 days	5.1% (3.6%-6.7%)	7.4% (3.8%-11.0%)
3-4 days	2.5% (1.4%-3.6%)	2.7% (0.8%-4.5%)
5 days	1.0% (0.5%-1.4%)	1.8% (0.06%-3.6%)
6-10 days	3.6% (2.0%-5.2%)	2.8% (0.51%-5.2%)
>10 days	5.1% (3.7%-6.4%)	0.8% (0.00%-2.2%)
None	24.7% (21.3%-28.1%)	23.9% (18.1%-29.8%)

Figure 3-6: Number of Days Asthma Interfered with Work or Usual Activities Among Adults in the Past Year, Maryland, 2006-2008 Combined
 (Raw sample size = 1,060)

	Prevalence (95% CI)
1-2 days	6.3% (4.0%-8.6%)
3-7 days	10.3% (7.9%-12.8%)
8-29 days	4.1% (2.7%-5.6%)
≥30 days	4.5% (3.3%-5.8%)
None	74.0% (71.0%-78.4%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 3-7: Perceived Health Status of Persons who Currently Have Asthma vs. Persons Who Do Not, Maryland, 2005-2007 Combined (Raw sample size = 26,026)

Health Status	Percent With Asthma (95% CI)	Percent Without Asthma (95% CI)
Excellent/Very Good	45.4% (42.4%-48.4%)	58.7% (54.2%-63.3%)
Fair/Poor	23.8% (21.5%-26.2%)	13.4% (10.5%-16.3%)

Note: BRFSS includes five categories, Excellent, Very Good, Good, Fair, and Poor. For this comparison, we did not show the “Good” group, and we combined Excellent with Very Good, and Fair with Poor.

Figure 3-8: Number of Routine Asthma Check-ups Among Adults and Children in the Past Year, Maryland, 2006-2008 Combined (Raw sample size: Adults = 784; Children = 277)

	Number of Routine Asthma Check-ups in Past Year	
	Adults (95% CI)	Children (95% CI)
1-2 times	51.6% (46.6%-56.6%)	56.6% (49.1%-64.1%)
3-5 times	17.9% (14.4%-21.5%)	17.0% (10.9%-23.1%)
> 5 times	6.7% (4.8%-8.6%)	8.4% (3.6%-13.2%)
None	23.8% (19.6%-28.0%)	17.9% (12.6%-23.2%)

Figure 3-9: Number of Emergency Room Visits Among Adults and Children in the Past Year, Maryland, 2006-2008 Combined (Raw sample size: Adults = 790; Children = 278)

	Number of Emergency Room Visits in Past Year	
	Adults (95% CI)	Children (95% CI)
1-2 times	9.8% (7.2%-12.4%)	17.4% (11.4%-23.3%)
3-5 times	2.2% (1.1%-3.4%)	3.9% (1.1%-6.7%)
> 5 times	1.0% (0.0%-2.3%)	--
None	87.0% (84.0%-90.1%)	78.7% (72.4%-85.1%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 3-10: Number of Doctor Visits Among Adults and Children in the Past Year for Urgent or Worsening Asthma Symptoms, Maryland, 2006-2008 Combined (Raw sample size: Adults = 784; Children = 276)

	Number of Doctor Visits in Past Year	
	Adults (95% CI)	Children (95% CI)
1-2 times	23.2% (19.3%-27.2%)	26.9% (19.9%-33.9%)
3-5 times	5.1% (3.1%-7.0%)	9.0% (4.8%-13.2%)
> 5 times	2.1% (1.1%-3.1%)	0.9% (0.1%-1.7%)
None	69.6% (65.3%-73.9%)	63.2% (55.8%-70.6%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 6-1: Environmental Triggers in the Home of Adults and Children with Asthma, Maryland, 2006-2008 Combined (Raw sample size approximately 400)

	Environmental Triggers in the Home	
	Adults (95% CI)	Children (95% CI)
Cockroach seen in home in the past month	5.4% (3.7%-7.1%)	3.0% (0.8%-5.2%)
Unvented gas logs, gas fireplaces, or gas stoves used in home	5.5% (3.8%-7.2%)	5.3% (2.4%-8.2%)
Mice or rats seen in home in the past month	7.2% (5.4%-9.0%)	7.0% (4.1%-9.8%)
Mold inside home	12.8% (10.3%-15.3%)	7.3% (4.5%-10.2%)
Smoking inside home in the past week	14.1% (11.3%-16.8%)	8.2% (4.7%-11.7%)
Wood burning fireplace or stove used in home	23.3% (19.7%-27.0%)	22.4% (17.1%-27.7%)
Gas used for cooking	43.3% (39.2%-47.3%)	49.5% (43.2%-55.9%)
Pets in bedroom	46.1% (41.9%-50.3%)	55.7% (47.6%-63.9%)
Indoor pets	59.1% (55.1%-63.2%)	57.4% (51.0%-63.8%)
Carpeting or rugs in bedroom	72.8% (69.2%-76.5%)	72.8% (67.1%-78.5%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 6-2: Environmental Modifications in the Home of Adults and Children with Asthma, Maryland, 2006-2008 Combined (Raw sample size approximately 400)

	Environmental Modifications in the Home	
	Adults (95% CI)	Children (95% CI)
Pillow cover used for controlling dust mites	25.4% (22.1%-28.6%)	32.5% (26.6%-38.5%)
Mattress cover used for controlling dust mites	29.3% (25.7%-32.9%)	34.7% (28.7%-40.8%)
Dehumidifier regularly used	35.1% (31.0%-39.1%)	41.4% (35.0%-47.7%)
Air cleaner or purifier regularly used	35.8% (31.7%-39.9%)	35.2% (29.0%-41.4%)
Sheets and pillow cases washed in hot water	23.8% (20.4%-27.2%)	42.9% (36.5%-49.3%)
Exhaust fan regularly used in bathroom	64.0% (60.2%-67.9%)	62.3% (56.1%-68.4%)
Exhaust fan regularly used when cooking	66.6% (62.8%-70.4%)	68.9% (63.2-74.5%)

Figure 7-4: Number of Missed School Days Due to Asthma Among Children in Past Year, Maryland, 2006-2008 Combined (Raw sample size = 232)

	Number of Missed School Days
	Prevalence (95% CI)
1-2 days	16.8% (10.7%-22.8%)
3-7 days	16.6% (9.9%-23.2%)
8-29 days	5.7% (2.3%-9.1%)
≥30 days	1.8% (0.0%-4.0%)
None	59.1% (50.9%-67.4%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 7-5: Asthma Action Plan and Medication at School, School-aged Children, Maryland, 2006-2008 Combined (Raw sample size approximately 200)

	Prevalence (95% CI)
Child has Asthma Action Plan	38.9% (30.6%-47.1%)
Child Allowed to Cary Asthma Medication	41.0% (32.1%-49.9%)

Figure 8-1: Prevalence of Work Related Asthma among Adults with Asthma, Maryland, 2006-2008 Combined

	Prevalence of Work Related Asthma (95% CI)		
	Total	Male	Female
Ever told by health professional that asthma was work-related	8.5% (6.4%-10.6%)	3.4% (1.8%-4.9%)	5.1% (3.7%-6.6%)
Every told health professional that asthma was work-related	11.5% (8.5%-14.4%)	5.2% (2.6%-7.8%)	6.3% (4.6%-7.9%)
Asthma caused by chemicals, smoke, fumes or dust in current job	7.8% (5.3%-10.4%)	2.6% (0.7%-4.5%)	5.3% (3.5%-7.0%)
Asthma made worse by chemicals, smoke, fumes or dust in current job	24.4% (19.5%-29.2%)	7.4% (4.1%-10.7%)	17.0% (13.1%-20.9%)
Asthma caused by chemicals, smoke, fumes or dust in any previous job	14.7% (11.6%-17.8%)	7.0% (4.3%-9.8%)	7.7% (5.9%-9.5%)
Asthma made worse by chemicals, smoke, fumes or dust in any previous job	28.5% (24.6%-32.5%)	11.9% (8.7%-15.1%)	16.6% (13.8%-19.5%)
Ever changed jobs because it caused or made asthma worse	27.1% (19.1%-35.1%)	14.6% (7.0%-22.3%)	12.5% (7.7%-17.3%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 9-1: Number of Co-morbid Conditions Among Adults with Asthma, Maryland, 2006-2008 Combined (Raw sample size approximately 1340)

	Number of Co-morbid Conditions
	Prevalence (95% CI)
Emphysema	4.6% (3.4%-5.8%)
COPD	6.9% (5.5%-8.3%)
Chronic Bronchitis	21.1% (18.1-24.0)
Depression	30.6% (26.8-34.3)

Figure 14-1: Current Asthma Prevalence Among Adults by Race, Maryland, 2007 (Raw sample size = 758)

Race/Ethnicity	Prevalence (95% CI)
White, Non-Hispanic	8.6% (7.8% - 9.4%)
Black, Non-Hispanic	8.6% (6.7% - 10.5%)

Figure 14-6: Current Asthma Prevalence Among Adults by Sex, Maryland, 2007 (Raw sample size = 770)

Race/Ethnicity	Prevalence (95% CI)
Male	5.9% (4.9% - 6.9%)
Female	10.4% (9.4% - 11.4%)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 15-1: Lifetime Asthma Prevalence Among Adult by Race/Ethnicity, Maryland vs. United States, 2003-2007

Race/Ethnicity	Maryland Prevalence (95% CI)	U.S. Prevalence (95% CI)
Hispanic	11.2% (8.7% - 13.7%)	9.6% (NA)
White, Non-Hispanic	12.8% (12.3% - 13.3%)	12.9% (NA)
Black, Non-Hispanic	14.5% (13.4% - 15.6%)	14.0% (NA)
Other, Non-Hispanic	11.5% (9.3% - 13.7%)	13.3% (NA)
Total	13.1% (12.7% - 13.6%)	13.0% (NA)

Figure 15-2: Current Asthma Prevalence Among Adult by Race/Ethnicity, Maryland vs. United States, 2003-2007

Race/Ethnicity	Maryland Prevalence (95% CI)	U.S. Prevalence (95% CI)
Hispanic	5.6% (3.8% - 8.7%)	5.8% (NA)
White, Non-Hispanic	8.1% (7.7% - 8.4%)	8.6% (NA)
Black, Non-Hispanic	9.2% (8.3% - 10.1%)	9.2% (NA)
Other, Non-Hispanic	7.5% (5.7% - 9.3%)	8.2% (NA)
Total	8.2% (7.9% - 8.6%)	8.4% (NA)

Appendix A: 95% Confidence Intervals for BRFSS Data - Continued

Figure 16-1: Raw Sample Sizes for Asthma Lifetime and Current Prevalence by County, BRFSS 2005-2007

Jurisdiction	Sample Size	Lifetime Prevalence 2005-2007 Weighted Percent (95% CI)	Current Prevalence 2005-2007 Weighted Percent (95% CI)
NORTHWEST	520	12.0 (10.8-13.2)	
Garrett	58	8.3 (5.5-11.1)	6.2 (3.8-8.6)
Allegany	89	11.6 (8.8-14.4)	8.2 (5.8-10.6)
Washington	170	13.5 (11.2-15.8)	8.5 (6.6-10.4)
Frederick	203	11.9 (10.0-13.8)	7.7 (6.2-9.2)
BALTIMORE METRO	894	12.9 (12.0-13.8)	
Baltimore City	263	16.1 (14.0-18.3)	11.1 (9.3-12.9)
Baltimore County	353	12.9 (11.4-14.4)	8.3 (7.1-9.5)
Anne Arundel	218	12.3 (10.4-14.2)	7.8 (6.3-9.3)
Carroll	101	15.0 (11.7-18.3)	10.3 (7.5-13.1)
Howard	98	9.9 (7.7-12.2)	6.1 (4.3-7.9)
Harford	124	15.7 (12.8-18.6)	10.5 (8.1-13.0)
NATIONAL CAPITOL			
Montgomery	422	12.4 (11.1-13.7)	7.7 (6.6-8.8)
Prince George's	295	13.6 (11.8-15.4)	8.7 (7.2-10.2)
SOUTHERN MD	281	12.3 (10.7-13.9)	
Calvert	74	10.7 (7.8-13.6)	7.3 (4.8-9.8)
Charles	115	14.8 (12.0-17.6)	8.1 (5.9-10.3)
Saint Mary's	92	10.1 (7.5-12.7)	7.1 (4.9-9.3)
EASTERN SHORE	649	13.5 (12.4-14.7)	
Cecil	117	14.3 (11.4-17.2)	8.8 (6.5-11.2)
Kent	38	11.0 (7.1-14.9)	7.6 (4.3-10.9)
Queen Anne's	80	12.7 (9.6-15.8)	8.4 (5.8-11.0)
Caroline	58	12.3 (8.6-16.0)	8.1 (5.0-11.2)
Talbot	78	10.8 (7.9-13.7)	6.5 (4.2-8.8)
Dorchester	70	21.1 (16.6-25.6)	12.0 (8.4-15.6)
Wicomico	107	13.0 (10.2-15.8)	9.8 (7.3-12.3)
Somerset	47	16.1 (10.7-21.5)	13.8 (8.7-18.9)
Worcester	54	11.8 (8.4-15.2)	7.8 (5.0-10.6)
TOTAL	3,324	13.1 (12.6-13.6)	8.5 (8.1-8.9)

Appendix B: Technical Notes

In this report, unless otherwise stated, the rates were 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 i.e., 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 want to compare population that differ 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 individual i.e. African Americans, Hispanic/Latino, or the elderly. In such cases where an individual would like to compare populations with different age distribution, 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.

The crude and age-adjusted rates for asthma morbidity can be found in **Appendix C**.

Appendix C: Data Tables

Table C-1: Crude and Age-Adjusted Emergency Department Visit Rate per 10,000 Residents by Sex, Race, and County, Maryland, 2007

	Crude Rate	Age-Adjusted Rate
Total	76.7	78.7
Gender		
Male	76.5	79.0
Female	76.9	78.1
Race		
White	35.3	36.5
Black	164.0	173.8
Other	83.5	90.0

Rates are age-adjusted to 2000 U.S. standard population

Table C-2: Crude and Age-Adjusted Hospitalization Rate per 10,000 Residents by Sex, Race, Ethnicity, and County, Maryland, 2007

	2005		2006		2007	
	Crude Rate	Age-Adjusted Rate	Crude Rate	Age-Adjusted Rate	Crude Rate	Age-Adjusted Rate
Total	17.3	17.2	18.4	18.4	18.6	18.5
Gender						
Male	13.8	13.9	14.9	15.0	15.4	15.5
Female	20.6	20.3	21.7	21.5	21.6	21.3
Race						
White	11.7	11.8	11.8	11.9	11.3	11.4
Black	27.3	28.7	29.1	31.0	30.5	32.3
Other	12.3	15.2	16.1	21.1	16.9	22.4
Ethnicity						
Hispanic	6.7	6.8	7.9	8.1	7.9	7.7
Non-Hispanic	16.9	17.0	17.8	17.8	17.9	17.9

Rates are age-adjusted to 2000 U.S. standard population



Martin O'Malley, Governor
Anthony G. Brown, Lieutenant Governor
John M. Colmers, Secretary, DHMH

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