West Virginia
Asthma Burden Report
2007-2010

Issue 1: Asthma Prevalence In West Virginia

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WEST VIRGINIA Department of Health & Human Resources

Preface

The West Virginia Asthma Education and Prevention Program (WV-AEPP) will publish issues of the *West Virginia Asthma Burden* as they are completed in order to get these data to you in a timely manner. This report is an update to *The Burden of Asthma in West Virginia* published in 2007 and is the most comprehensive source of information about asthma in the state. This report seeks to distribute information to WV-AEPP partners, health care providers, and public health professionals for the planning, development, and implementation of asthma-related activities.

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Asthma Prevalence in West Virginia

Asthma is a chronic lung disease that causes repeated episodes of wheezing, breathlessness, chest tightness, and coughing. While the cause of asthma is unknown, asthma episodes may be triggered by exposures to allergens (such as pollen, mold, and animal dander), irritants (such as tobacco smoke or air pollution), and occupational hazards. There is no cure for asthma, but symptoms can be controlled through the proper use of medications and avoidance of identified triggers[1].

The burden of asthma is unequally distributed among West Virginians. Adult females, adults who have an annual household income below $25,000 and are not high school graduates (low socioeconomic status (SES)), as well as public middle school students have a higher prevalence of current asthma in the state. Although the overall burden of asthma has improved; demographic, socioeconomic, and regional differences in asthma prevalence persist.

Definitions

The prevalence of asthma is the total number of individuals with asthma in the population at a given time divided by the number of individuals in the population. This prevalence information is obtained via the Behavioral Risk Factor Surveillance System Survey (BRFSS) (see Appendix A for information on data sources), the main source of data for the West Virginia Asthma Education and Prevention Program (WV-AEPP). The core module of the BRFSS administered among adults includes two questions about asthma:

(1) "Have you ever been told by a doctor, nurse or other health professional that you had asthma?"
(2) "Do you still have asthma?"

The BRFSS uses the following questions answered by an adult proxy to define asthma for West Virginia children age 17 and younger:

(1) "Has a doctor, nurse, or other health professional ever said that the child has asthma?"
(2) "Does the child still have asthma?"

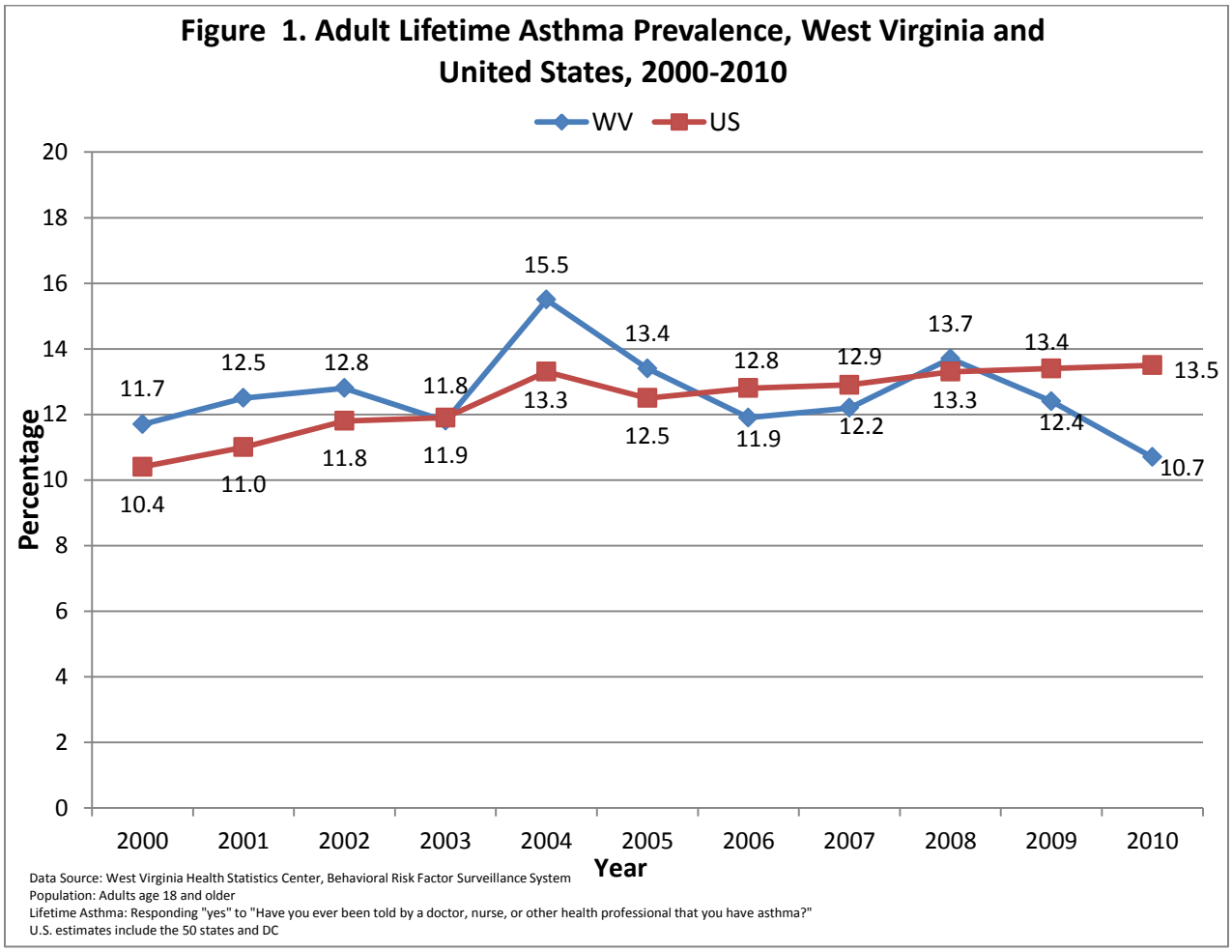
The second survey used to determine the prevalence of asthma among West Virginia children age 17 and younger is the West Virginia Department of Education's Youth Tobacco Survey (YTS) (see Appendix A). The YTS is given directly to 6-12th graders enrolled in West Virginia public middle and high schools and asks:

(1) "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"
(2) "Do you still have asthma?"

- ★ Individuals are categorized as having lifetime asthma when there is a "yes" response to the first question on the BRFSS or YTS.
- ★ Individuals are categorized as having current asthma when there is a "yes" response to the first and second question on the BRFSS or YTS.

Adult Lifetime Asthma Trends

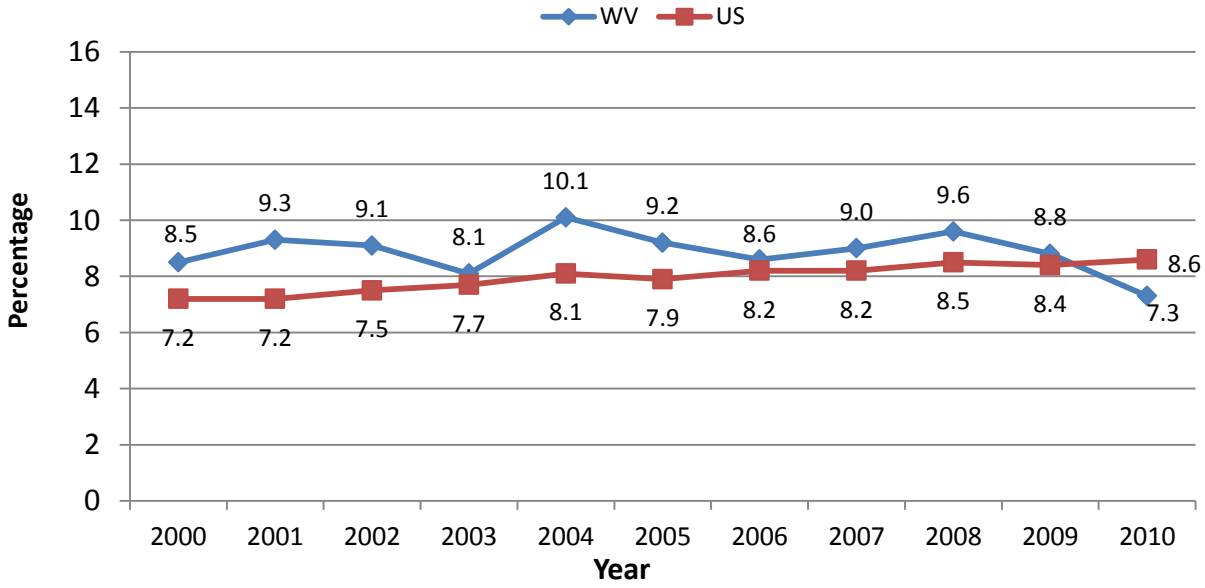
In 2010, approximately 153,300 (10.7%) of West Virginia adults reported being diagnosed with asthma at some point in their life. This prevalence estimate was the lowest for lifetime asthma among West Virginia adults since 2000 and was statistically significantly lower (see appendix B for methodology) than the United States 2010 estimate (13.5%). There was a slight rise in adult lifetime asthma prevalence among West Virginians in 2008, although not statistically significant. Overall in the United States, the prevalence of lifetime asthma among adults has steadily increased while the lifetime asthma prevalence among West Virginia adults has decreased after its peak in 2004 (15.5%), which was statistically significantly higher than the 2004 United States prevalence (13.3%) (Figure 1).



Adult Current Asthma Trends

In 2010, approximately 103,500 (7.3%) of West Virginia adults reported having current asthma. Since its peak in 2004 (10.1%), the prevalence of current asthma among adults in West Virginia decreased overall, while the prevalence of current asthma increased among adults in the United States (Figure 2). West Virginia reported higher adult current asthma prevalence than the United States estimates in every year except 2010. The differences reported in 2001, 2002, 2004, 2005 and 2010 were statistically significant.

Figure 2. Adult Current Asthma Prevalence, West Virginia and United States, 2000-2010



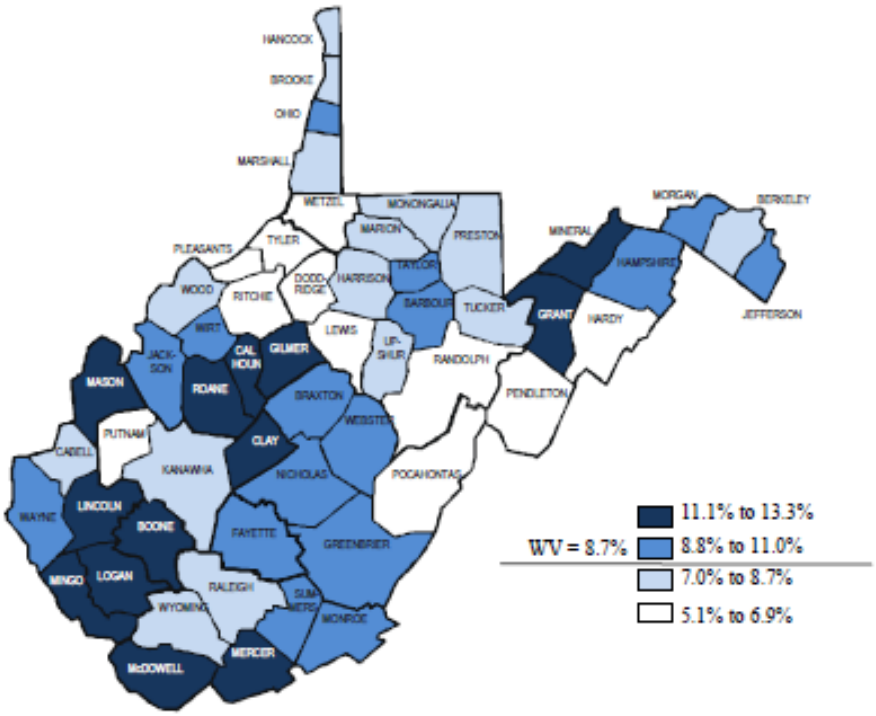
Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: Adults age 18 and older
Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"
US estimates include the 50 states and DC

Demographic Factors

Geographic Area

The prevalence of adult current asthma ranged from a low of 5.1% in Randolph County, which was statistically significantly lower than the 2006-2010 overall state prevalence (8.7%), to a high of 13.3% in Mason County and the Calhoun/Clay/Gilmer/Roane area (Figure 3). Only in Mason County was the prevalence of asthma statistically significantly higher than the West Virginia prevalence estimate. The Hardy/Pendleton/Pocahontas and Doddridge/Lewis/Ritchie areas had a statistically significantly lower prevalence of adult current asthma at 5.4% and 5.6% respectively (see Appendix C for detailed tables).

Figure 3. Adult Current Asthma Prevalence by County, West Virginia, 2006-2010

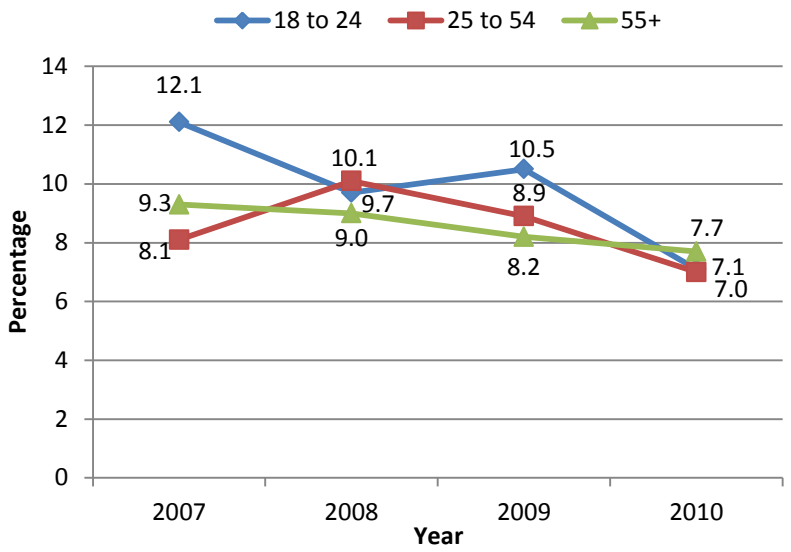


Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System.
Population: West Virginians age 18 and older.
Current Asthma = Responding 'yes' to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Note: Multiple years of data and counties were combined for analysis. Individual county estimates are not available for all counties.

Age

Although there were slight differences in current asthma prevalence by age group, none of these were statistically significant (see Appendix C). In 2010, adults aged 55 and over had the highest current asthma prevalence in West Virginia while adults aged 25-54 had the lowest current asthma prevalence (Figure 4).

Figure 4. Adult Current Asthma Prevalence by Age, West Virginia, 2007-2010

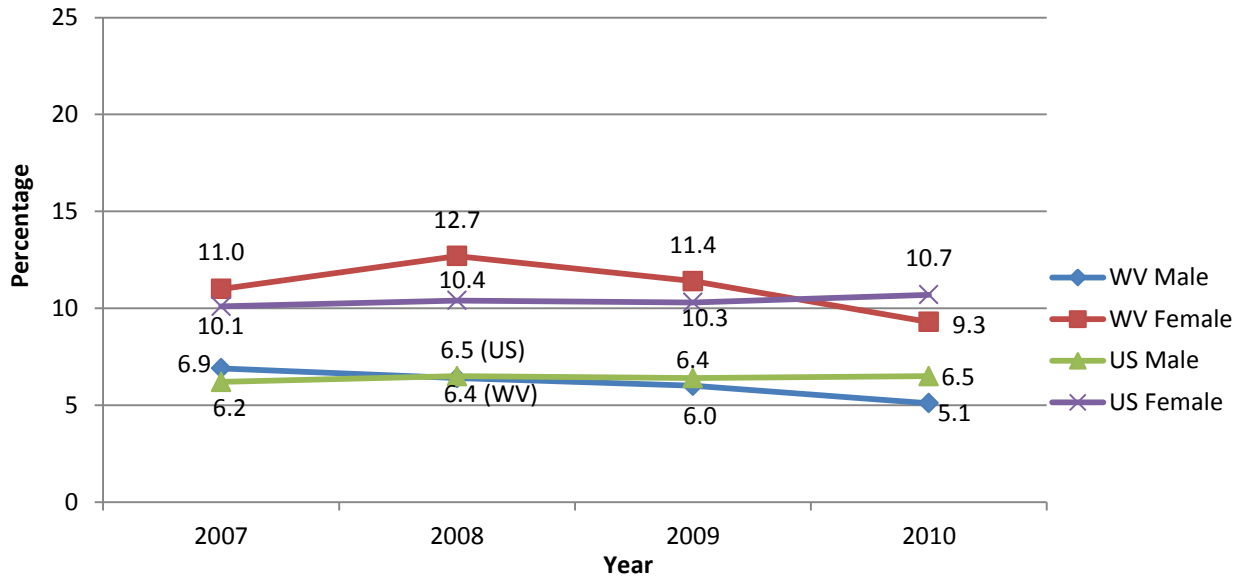


Data Source: West Virginia Health Statistics Center, Behavior Risk Factor Surveillance System
Population: West Virginia Residents age 18 and older
Current asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Gender

Adult females consistently had a significantly higher prevalence of current asthma than adult males in West Virginia, as well as the United States (Figure 5). In 2008, the current asthma prevalence of adult females in West Virginia was statistically significantly higher than the corresponding United States prevalence (10.4%). Among adult males in West Virginia, the current asthma prevalence steadily decreased over time, while remaining relatively stable among adult males in the United States.

Figure 5. Adult Current Asthma Prevalence by Gender, West Virginia and United States, 2007-2010

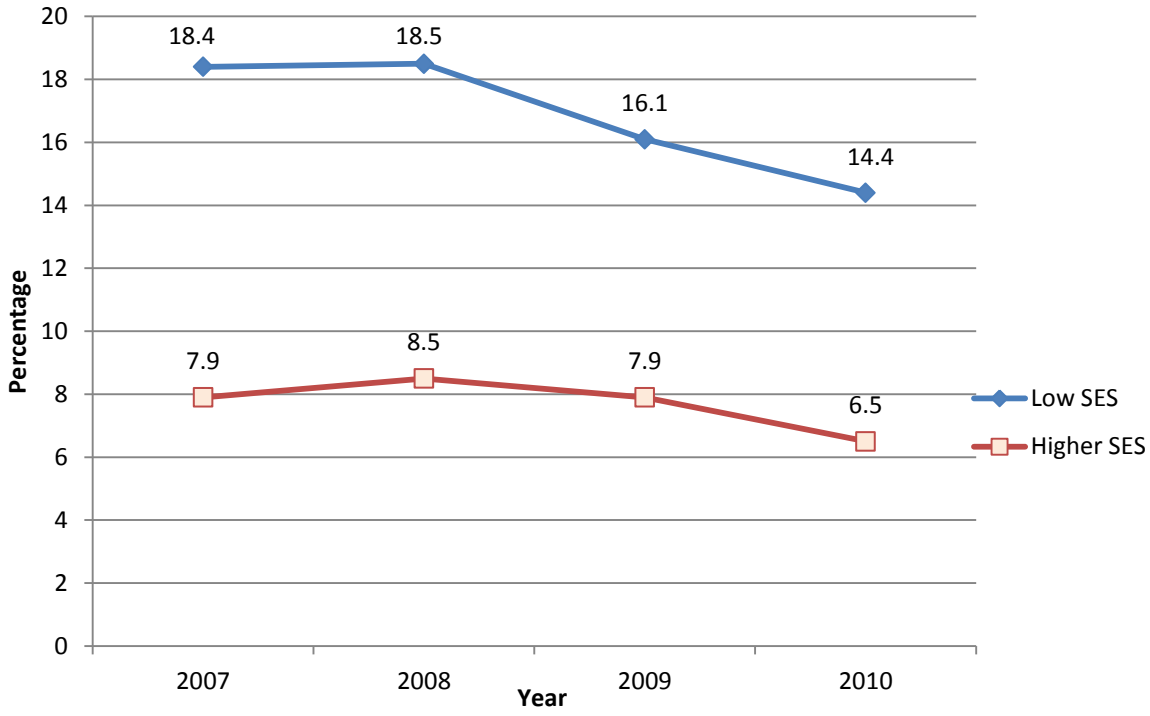


Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: Adults age 18 and older
Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Socioeconomic Status

Low socioeconomic status (SES) is defined as an adult having a household income less than $25,000 and being a high school non-graduate. High SES is defined as an adult having a household income greater than or equal to $25,000 and having received a high school diploma or more education. In 2010, 14.4% of West Virginia adults who were classified as having a low SES also reported having current asthma (Figure 6). This percentage was more than double that of adults of a higher SES that reported having current asthma (6.5%). The difference between adults of low SES and higher SES with current asthma was statistically significant and more than double each year.

Figure 6. Adult Current Asthma Prevalence by Socioeconomic Status, West Virginia, 2007-2010

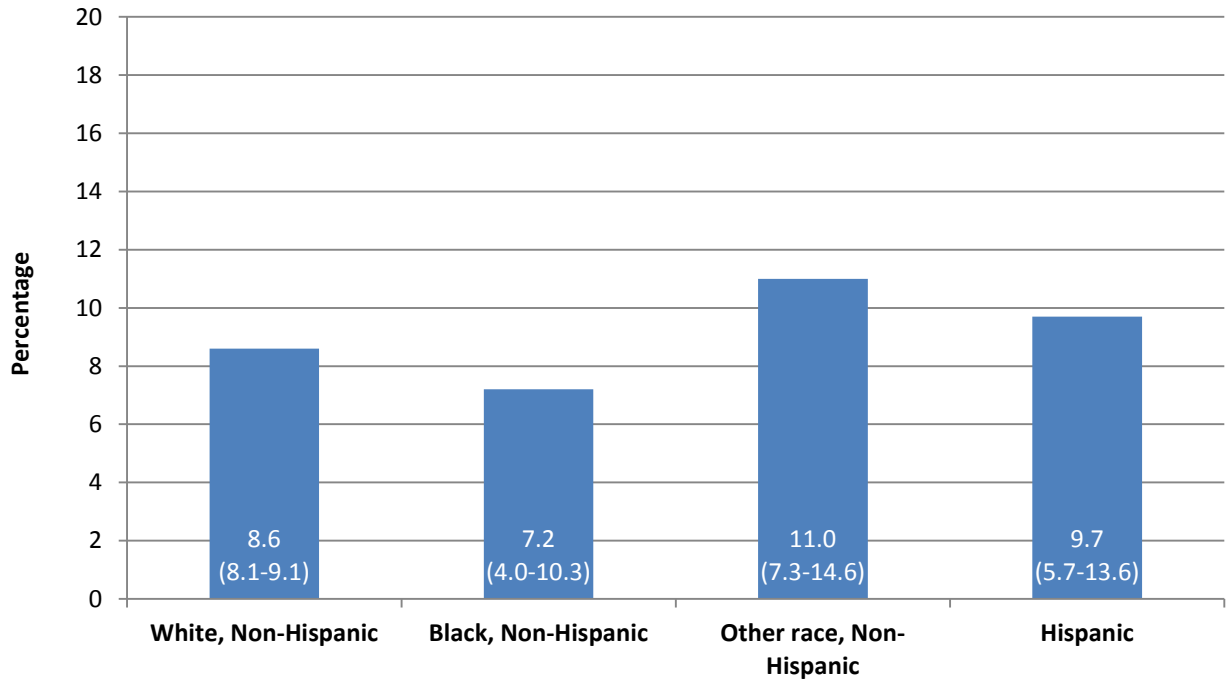


Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: West Virginia Adults age 18 and older
Current asthma=Responding yes to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Low SES=income ≤$25,000 and education < high school diploma; higher SES=income >$25,000 and education ≥ high school diploma

Race/ethnicity

According to the United States Census Bureau, West Virginia is made up of 94.1% White, 3.5% Black, 1.3% Hispanic and 2.3% other (Asian, Hawaiian/Pacific Islander, multiracial) persons[2]. The demographic composition of West Virginia adults with asthma followed a similar pattern. Each racial/ethnic group had its own burden of asthma although the differences observed between racial/ethnic groups in 2006-2010 were not statistically significant. Current asthma prevalence among adults of "other" racial/ethnic groups was highest (11.0%) while Non-Hispanic blacks had the lowest prevalence during this time at 7.2% (Figure 7). It is important to remember that although certain groups may seem to have had higher asthma prevalence, the number of people comprising racial and ethnic minority groups is lower (see Appendix C).

Figure 7. Adult Current Asthma among Racial/Ethnic Groups in West Virginia, 2006-2010



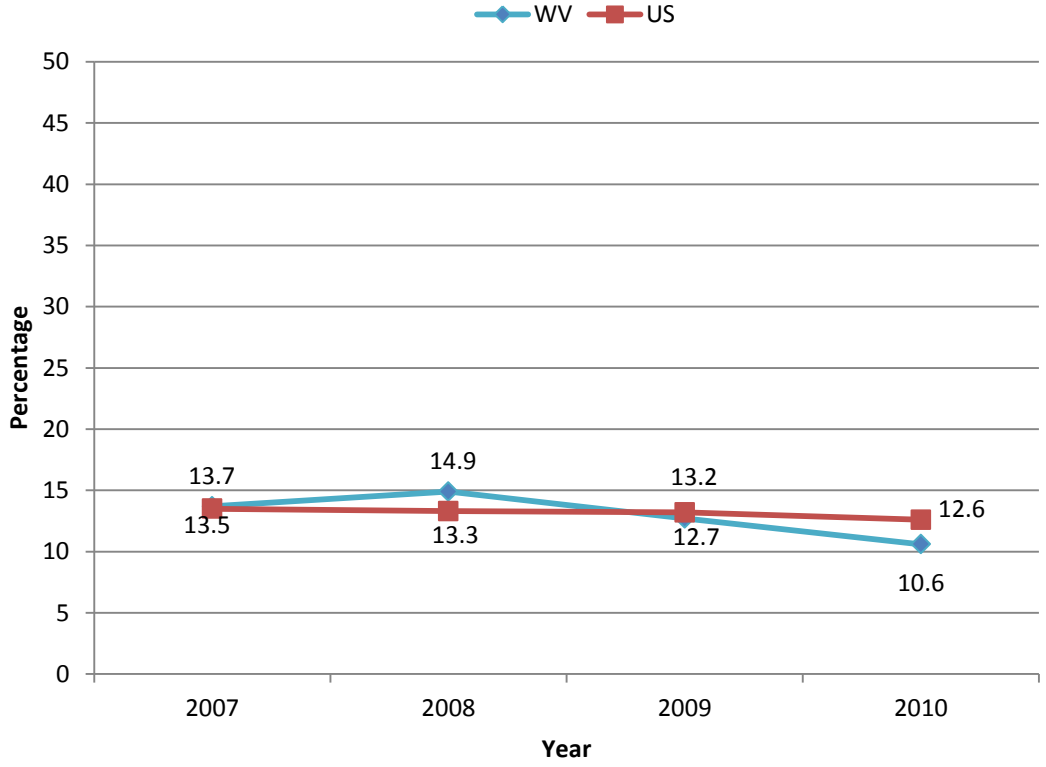
Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: West Virginia Adults 18 and older
Current asthma=Responding yes to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Other race: Asian only, American Indian or Alaska Native only, Multiracial, or Other

Asthma among Children and Youth

Child Lifetime Asthma Prevalence Trends – Behavioral Risk Factor Surveillance System

In 2010, about 40,000 (10.6%) children aged 17 and younger in West Virginia had ever been diagnosed with asthma. Although child lifetime asthma prevalence in West Virginia peaked in 2008 (14.9%) and was higher than United States estimates in 2007 and 2008 (Figure 8), the differences were not statistically significant. The prevalence of lifetime asthma in children decreased overall in West Virginia and the United States since 2007, with the West Virginia prevalence dropping below the United States estimate in 2010.

Figure 8. Child Lifetime Asthma Prevalence, West Virginia and United States, 2007-2010

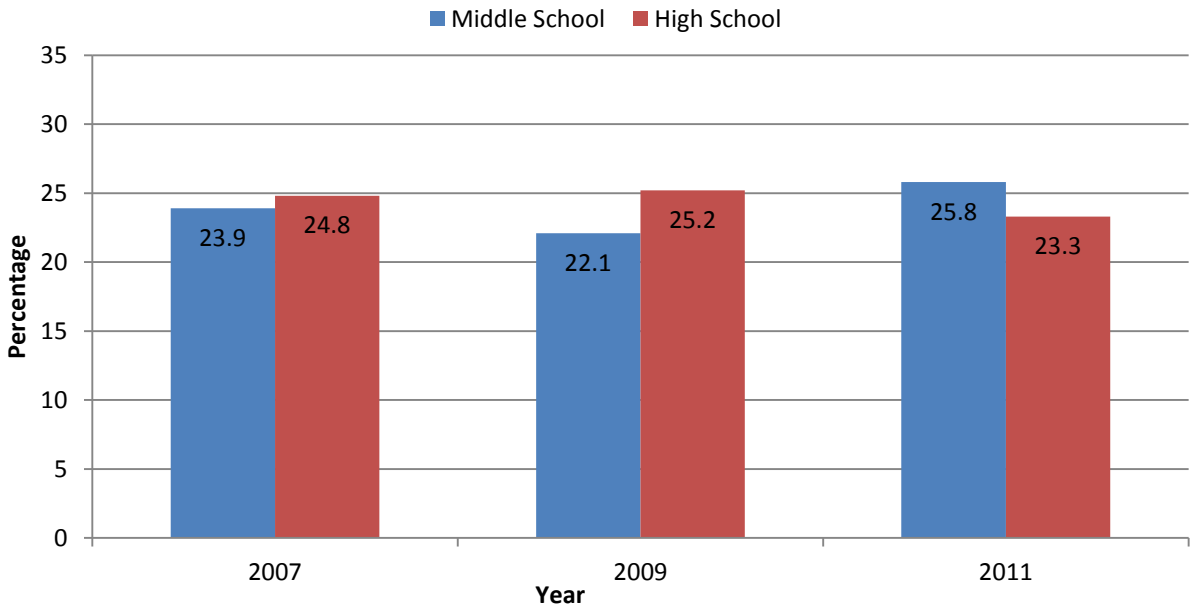


Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: West Virginia Children age 17 and younger
Lifetime asthma: Responding "yes" to "Has a doctor, nurse, or other health professional ever said that the child has asthma?"

Youth Lifetime Asthma Prevalence Trends – Youth Tobacco Survey (YTS)

According to the YTS administered in 2011, more than 14,500 (25.8%) middle school students and nearly 17,800 (23.3%) high school students in West Virginia reported having ever been diagnosed with asthma during their lifetime (Figure 9). Only in 2011 was the lifetime asthma prevalence lower among high school students (grades 9-12) than middle school students (grades 6-8) and none of the variations in lifetime asthma prevalence were statistically significant.

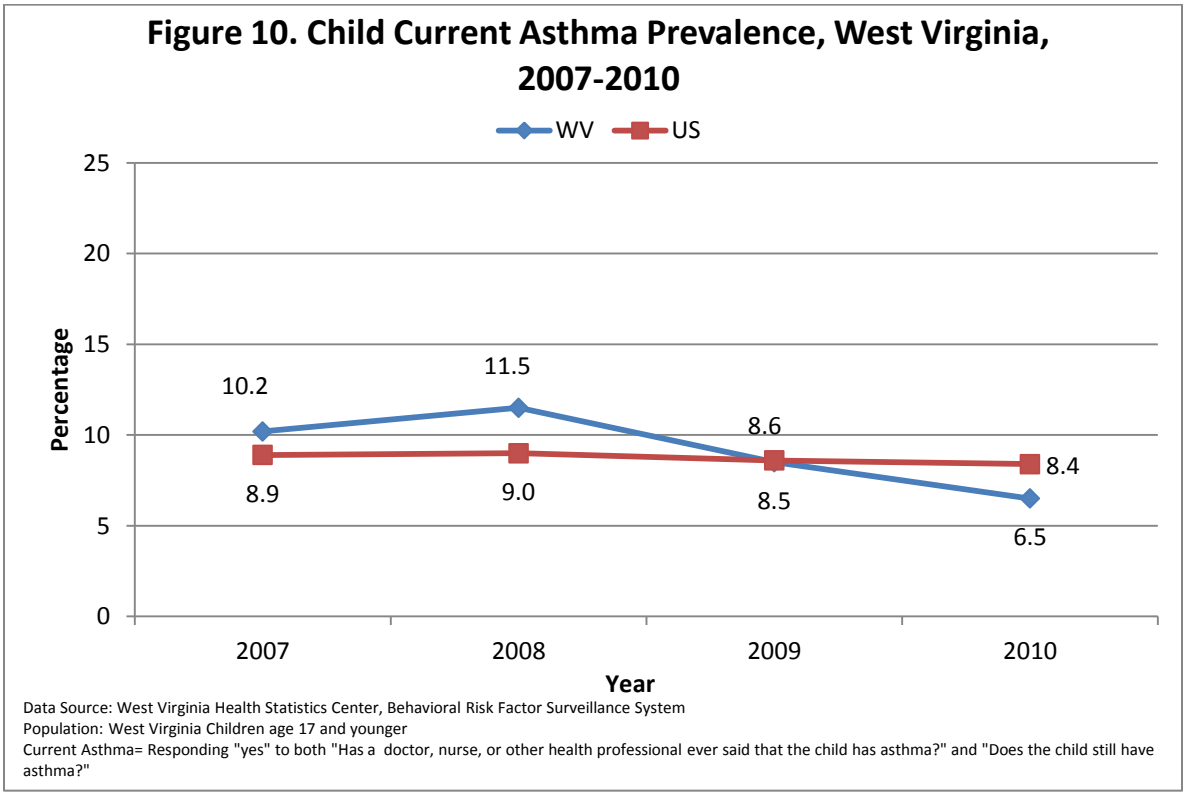
Figure 9. Lifetime Asthma Prevalence among Middle and High School Students, West Virginia 2007-2011



Data Source: Department of Education, Youth Tobacco Survey; West Virginia Health Statistics Center
Population: West Virginia Middle and High School Students from Public Schools
Lifetime asthma: Responding "yes" to "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"

Child Current Asthma Prevalence Trends - Behavioral Risk Factor Surveillance System (BRFSS)

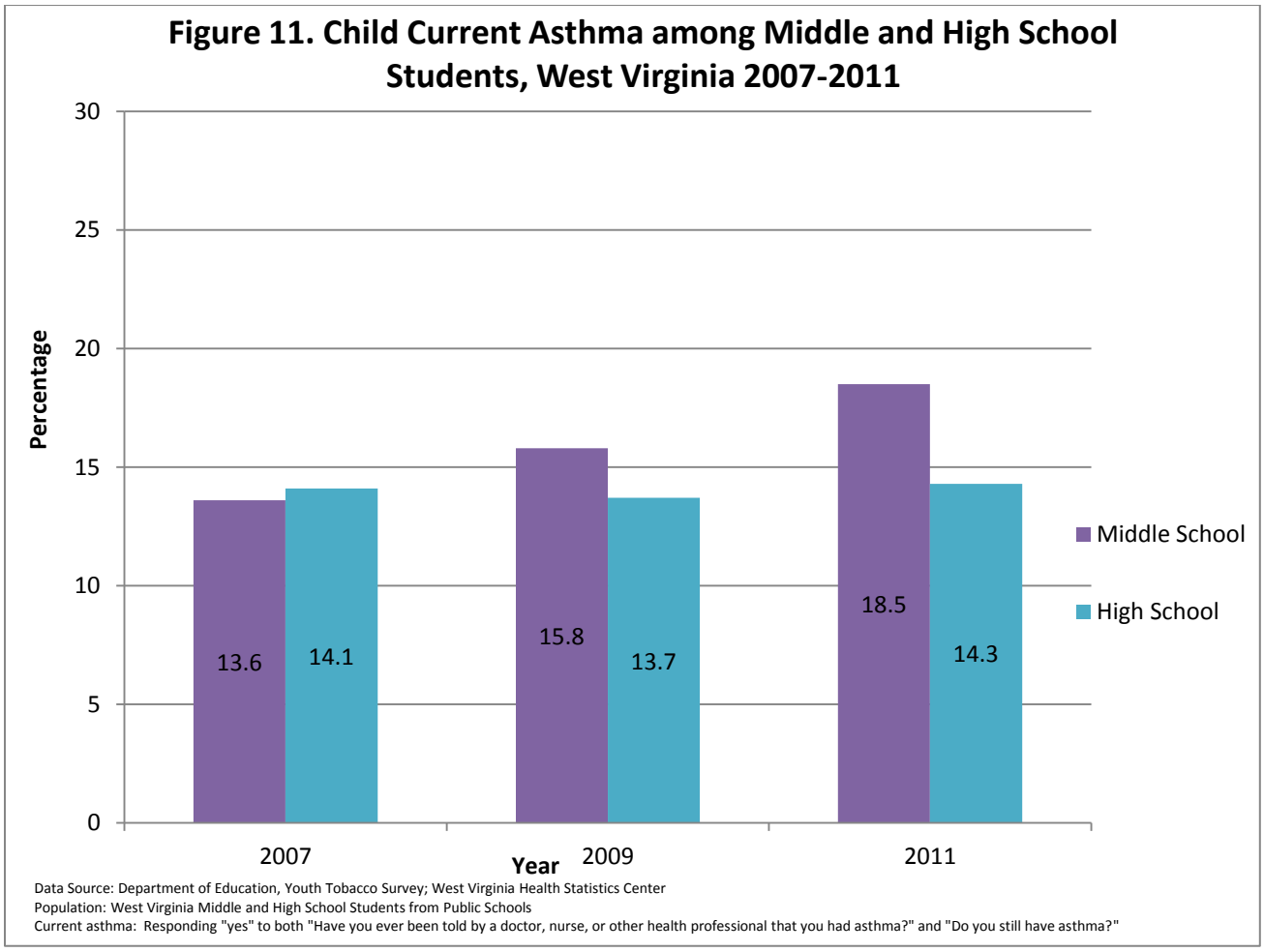
According to the BRFSS conducted in 2010, approximately 24,600 (6.5%) of West Virginia children age 17 and younger had current asthma. In 2007-2008, the current asthma prevalence among children in West Virginia was higher than children in the United States but the difference was not statistically significant. The peak of current asthma among West Virginia children occurred in 2008 (11.5%), and decreased below the United States estimates in 2009 and 2010 (Figure 10). The decrease of West Virginia child current asthma prevalence from 11.5% (2008) to 6.5% (2010) was statistically significant (see Appendix C).



Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: West Virginia Children age 17 and younger
Current Asthma= Responding "yes" to both "Has a doctor, nurse, or other health professional ever said that the child has asthma?" and "Does the child still have asthma?"

Youth Current Asthma Prevalence Trends – Youth Tobacco Survey (YTS)

Nearly 19% (10,000) of middle and more than 14% (10,500) of high school students reported having current asthma on the YTS administered in 2011. In every year except 2007, the prevalence of current asthma was higher among middle school students (Figure 11). Although the differences in prevalence of current asthma was not statistically significant between groups, the increase in prevalence from 2007 (13.6%) to 2011 (18.5%) among middle school students was statistically significant.

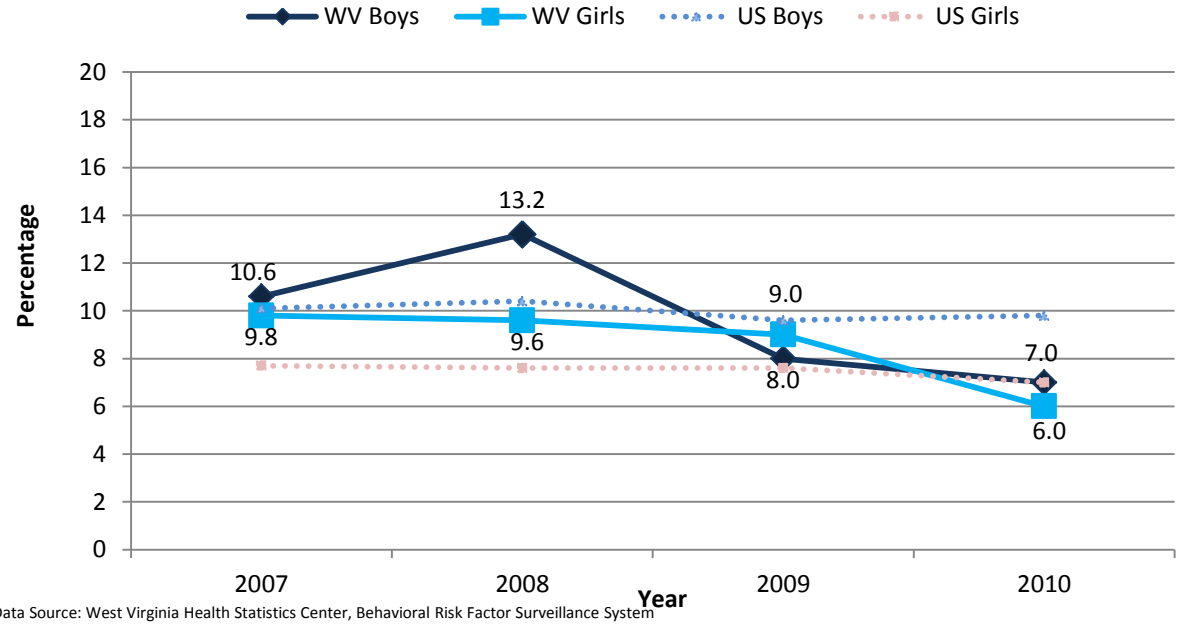


Demographic Factors – Behavioral Risk Factor Surveillance System (BRFSS)

Gender

In the United States, boys consistently had a statistically significant higher prevalence of current asthma than girls; West Virginia does not follow this trend. The prevalence of current asthma among West Virginia children age 17 and younger was higher among boys than girls in every year except 2009, though not statistically significant (Figure 12). The current asthma prevalence among girls in West Virginia steadily declined over time, likewise with boys after a peak in 2008 (13.2%). None of the decreases among girls were statistically significant; however the decrease among boys from 13.2% in 2008 to 7.0% in 2010 was statistically significant (see Appendix C).

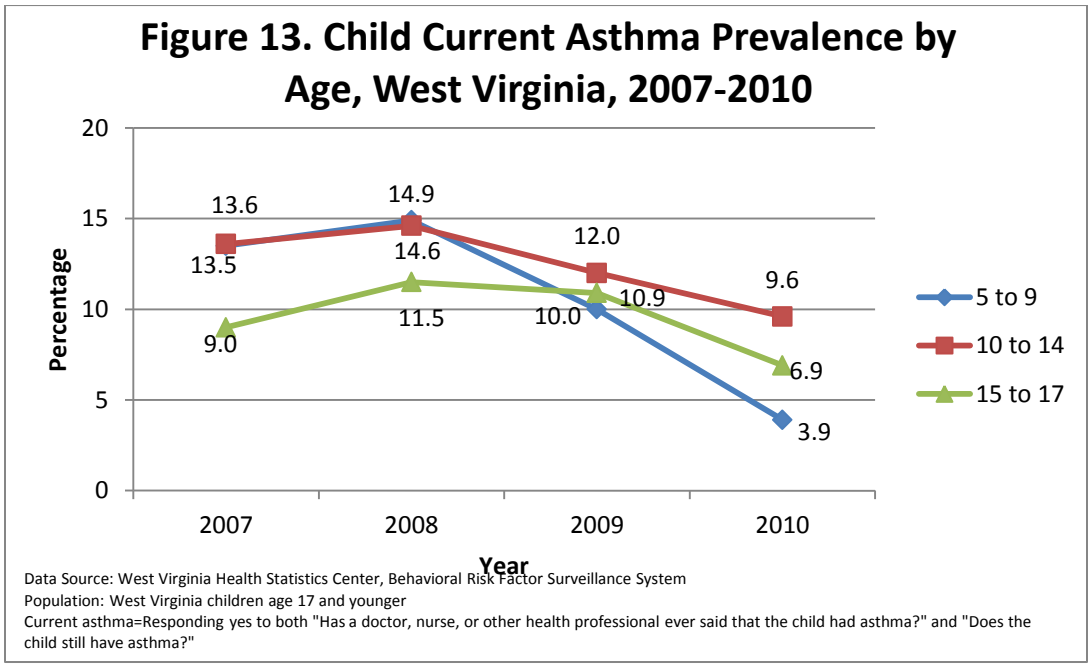
Figure 12. Child Current Asthma Prevalence by Gender, West Virginia and United States, 2007-2010



Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: West Virginia children age 17 and younger
Current Asthma: Responding "yes" to both "Has a doctor, nurse, or other health professional ever said that the child has asthma?" and "Does the child still have asthma?"

Age

As with adults in West Virginia, child current asthma prevalence fluctuated with respect to age (Figure 13). No statistically significant differences were noted among current asthma prevalence by age in West Virginia children (see Appendix C). In 2010, the current asthma prevalence was highest among 10-14 year olds (9.6%) and lowest among 5-9 year olds (3.9%). Note: seemingly large fluctuations may be erroneous due to small sample sizes, and were not statistically significant.

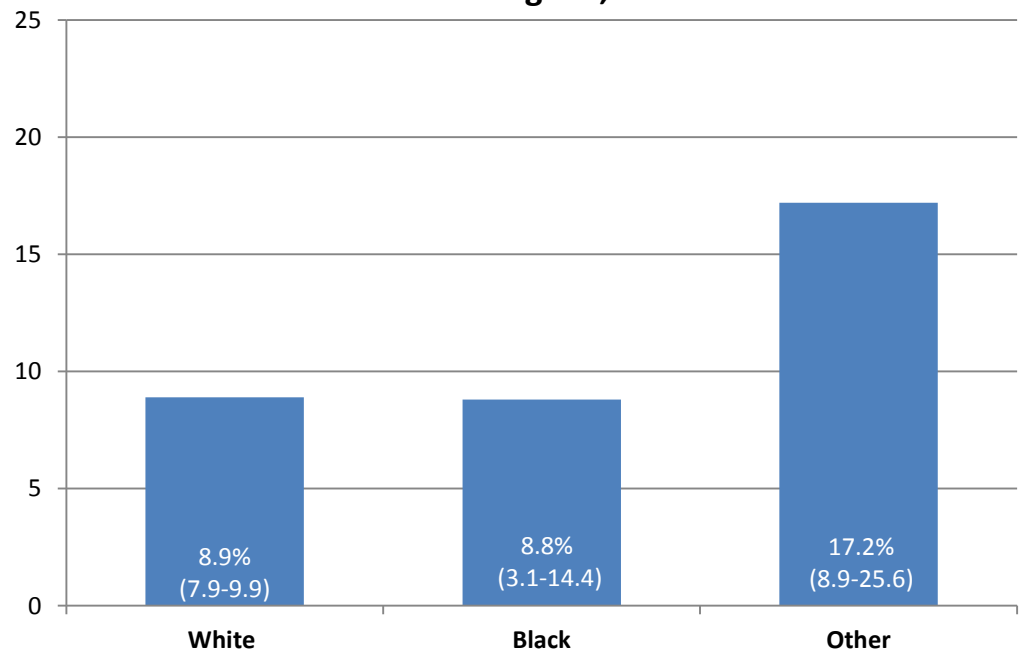


Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: West Virginia children age 17 and younger
Current asthma=Responding yes to both "Has a doctor, nurse, or other health professional ever said that the child had asthma?" and "Does the child still have asthma?"

Race

The racial composition of West Virginia children with current asthma mimics the racial structure of the state. As with West Virginia adults with current asthma, there were no statistically significant differences seen between races. Blacks had the lowest prevalence of current asthma (8.8%), while the prevalence of children of "other" races (Asian, American Indian, Alaska Native, Other) was highest at 17.2% (Figure 14). Recall that the number of people comprising racial and ethnic minority groups is lower, although these groups may seem to have had higher asthma prevalence (see Appendix C).

Figure 14. Child Current Asthma by Race in West Virginia, 2007-2010



Data Source: West Virginia Health Statistics Center, Behavioral Risk Factor Surveillance System
Population: West Virginia children age 17 and younger
Current Asthma= Responding "yes" to both "Has a doctor, nurse, or other health professional ever said that the child has asthma?" and "Does the child still have asthma?"
Other race: Asian only, American Indian or Alaska Native Only, Other race only.

References

1. Centers for Disease Control and Prevention. (2011, May 4). *Asthma in the US: Growing every year.* Retrieved July 10, 2012, from CDC Vital Signs: http://www.cdc.gov/vitalsigns/asthma/

2. United States Census Bureau. (2013, January 24). *State and County QuickFacts*. Retrieved Januray 24, 2013, from West Virginia QuickFacts from the US Census Bureau: http://quickfacts.census.gov/qfd/states/54000.html

Appendix A: Data Sources

Behavioral Risk Factor Surveillance System (BRFSS): The BRFSS survey is a state-based, ongoing, random-digit-dialed telephone survey of civilian, non-institutionalized adults ages 18 and older who live in the United States. Data on several topics are collected using the BRFSS, which allows for analysis of associations between various behaviors and asthma. The collection of these data has been occurring in a standard and reliable format for more than 25 years, allowing for analysis of time trends. Also, whereas a standard methodology is used in all states, state-to-state comparisons are possible. More recently, the BRFSS has been expanded to include more cell phone surveys. BRFSS data must be interpreted with caution as data are self-reported. Additionally, individuals may have difficulty recalling past behaviors or may understate behaviors known to be unhealthy, socially unacceptable, or illegal.

Since 2007, the BRFSS Asthma Call-back Survey (ACBS) was implemented in West Virginia as a follow-up to the BRFSS survey. Only one adult or child per household can participate in the ACBS, which obtains in-depth information about asthma symptoms, episodes/attacks, self-management education, healthcare utilization and access, medication use, comorbidities, and environmental allergens and irritants. For additional information visit: http://www.cdc.gov/brfss/. In order to maintain a level of consistency with our data reporting throughout the *Asthma Burden*, much of the data presented here begins in 2007.

Youth Tobacco Survey: The West Virginia Youth Tobacco Survey (WV-YTS) collects information on tobacco use, attitudes and knowledge regarding tobacco, exposure to tobacco-related media, exposure to environmental tobacco smoke, and asthma among adolescents. The WV-YTS was most recently administered in 2007, 2009, and 2011. Only 6-12 graders enrolled in West Virginia public schools are eligible to participate in this survey. These data are self-reported and should be interpreted with caution. Individuals may have difficulty recalling past behavior or may misstate behaviors due to the sensitivity of the questions. For additional information visit:
http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm

Appendix B: Methodology

95% Confidence Interval (95% CI): Confidence Intervals represent the range of values among which the true value would be found. This report presents the 95% CI, meaning that the true value would be within the given interval 95% of the time. Confidence intervals are mainly affected by the number of responses or events that the estimate is based on. If there are a small number of responses, the estimate will typically have large confidence intervals.

County-Level Data: County prevalence rates were calculated by using multiple years of aggregated BRFSS data. The data were reweighted to be representative of the 2000 age and sex population distribution by county. Aggregated sample sizes were large enough for 24 of the 55 counties to stand alone, that is, to yield individual county prevalence calculations. The data from the remaining 31 counties that had sample sizes too small to stand alone were combined into 12 groupings of counties. The aim was to arrive at as many groups of contiguous counties as possible, provided that the groups' sample sizes were sufficiently large for statistical analysis. In this report, county estimates were compared to the total West Virginia estimate for the same time period. This method better identifies disparities between counties. It also clearly identifies counties in need of health promotion interventions. The county maps included in this report classify counties according to the degree of difference from the West Virginia prevalence. County estimates, as well as county classifications compared to West Virginia can be found in appendix C.

Race/Ethnicity Data: Race/Ethnicity prevalence rates were calculated by using multiple years of BRFSS data. Given the racial composition of West Virginia, some sample sizes were too small to provide reliable estimates based on one year of data.

Rate: Rates are calculated by dividing the number of events in a given time period by the number of people at risk of experiencing the event in that time period. Percentages are rates presented as per 100 population.

Statistically Significant: In this report, rates are said to be statistically significant when the 95% CI associated with each of the rates does not overlap. It can be stated with 95% certainty that the difference found between the two rates is not a random occurrence.

Trends Data: Much of the data presented here represents 2007-2010 to provide consistency across chapters, as the BRFSS ACS was implemented in West Virginia in 2007. Additionally, the previous *Burden of Asthma in West Virginia* described surveillance data for the state up to 2006 and can be found at http://www.dhhr.wv.gov/hpcd/programs/wvasthma/Pages/AsthmaBurdenReport.aspx beginning May 1, 2013. In some cases the data date back to 2000 thus providing a more comprehensive picture of the burden of asthma in the state.

Based on CDC recommendations, estimates in this report were termed unreliable if any of the three following conditions were met:
(1) The estimate is based on responses from fewer than 50 respondents in the subsample or denominator of the prevalence estimate calculation.
(2) The 95% confidence interval of the estimate has a width or range greater than 20 (e.g., 95% CI = 10.0-30.5).
(3) The estimate has a relative standard error (RSE) of 30.0% or higher. The RSE is obtained by dividing the standard error of the estimate by the estimate itself. It is calculated by the SAS software, a commonly used statistical software package.

Appendix C: Detailed Tables

Table 1. Lifetime[a] and Current Asthma[b] among Adults, 2007-2010, BRFSS						
West Virginia						
Year	Lifetime Asthma			Current Asthma		
	Number[c]	%	95% CI	Number	%	95% CI
2000	162,200	11.7	10.3-13.2	117,000	8.5	7.3-9.7
2001	173,500	12.5	11.2-13.8	128,900	9.3	8.2-10.4
2002	179,100	12.8	11.5-14.1	126,900	9.1	8.0-10.2
2003	166,800	11.8	10.6-13.0	114,100	8.1	7.1-9.1
2004	219,900	15.5	14.1-16.9	143,400	10.1	9.0-11.2
2005	191,100	13.4	12.0-14.8	131,100	9.2	8.1-10.4
2006	170,600	11.9	10.5-13.2	122,900	8.6	7.4-9.7
2007	175,800	12.2	10.9-13.4	129,600	9.0	7.9-10.1
2008	196,100	13.7	12.3-15.0	137,700	9.6	8.5-10.7
2009	177,000	12.4	11.2-13.6	125,600	8.8	7.8-9.8
2010	153,300	10.7	9.4-12.0	103,500	7.3	6.3-8.2

Data Source: Behavioral Risk Factor Surveillance System
Population: West Virginia Adults age 18 and older
a. Lifetime Asthma=Responding “yes” to “have you ever been told by a doctor, nurse, or other health professional that you have asthma?”
b. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
c. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 2. Lifetime and Current Asthma among Adults, 2007-2010, BRFSS						
United States[a]						
Year	Lifetime Asthma[b]			Current Asthma[c]		
	Number[d]	%	95% CI	Number	%	95% CI
2000	20,827,700	10.4	10.2-10.7	14,306,300	7.2	7.0-7.4
2001	23,210,300	11.0	10.8-11.2	15,139,300	7.2	7.0-7.4
2002	25,176,200	11.8	11.6-12.0	15,960,500	7.5	7.3-7.7
2003	25,777,200	11.9	11.6-12.1	16,640,200	7.7	7.5-7.9
2004	29,064,300	13.3	13.1-13.6	17,624,900	8.1	7.9-8.3
2005	27,522,700	12.5	12.2-12.7	17,273,400	7.9	7.7-8.0
2006	28,534,300	12.8	12.5-13.0	17,273,400	8.2	8.0-8.4
2007	29,758,100	13.0	12.7-13.2	18,778,100	8.2	8.0-8.4
2008	30,901,200	13.3	13.1-13.5	19,618,000	8.5	8.3-8.6
2009	31,406,500	13.4	13.2-13.6	19,727,700	8.4	8.3-8.6
2010	31,891,700	13.5	13.3-13.7	20,317,400	8.6	8.5-8.8

Data Source: Behavioral Risk Factor Surveillance System
Population: United States Adults age 18 and older
a. United States estimates include 50 states and District of Columbia.
b. Lifetime Asthma=Responding “yes” to “have you ever been told by a doctor, nurse, or other health professional that you have asthma?”
c. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
d. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 3. Adult Current Asthma[a] Prevalence by County, West Virginia, 2006-2010, BRFSS				
County	Number[b]	%	95%CI	County vs. WV[c]
Individual Counties				
Berkeley	6,200	8.2	5.7-10.7	L
Brooke	1,400	7.4	3.9-10.9	L
Cabell	5,900	7.9	5.8-9.9	L
Fayette	4,000	11	7.3-14.7	H
Hancock	1,900	7.9	4.5-11.2	L
Harrison	4,600	8.6	6.1-11.2	L
Jefferson	3,900	10.2	5.5-14.8	H
Kanawha	11,000	7.4	6.0-8.8	L
Logan	3,200	11.5	7.8-15.2	H
McDowell	2,200	12.4	8.2-16.7	H
Marion	3,700	8.1	4.9-11.3	L
Marshall	1,800	7	3.8-10.1	L
Mason	2,700	13.3	9.2-17.4	SH
Mercer	5,300	11.1	7.9-14.2	H
Mingo	2,300	11.2	7.5-14.9	H
Monongalia	5,000	7	2.7-11.2	L
Ohio	3,400	9.6	5.9-13.3	H
Putnam	2,600	6.2	3.9-8.5	L
Raleigh	5,100	8.2	5.7-10.7	L
Randolph	1,100	5.1	2.6-7.6	SL
Upshur	1,400	7.3	3.0-11.6	L
Wayne	3,100	9.7	6.8-12.6	H
Wood	5,500	8.1	6.0-10.2	L
Wyoming	1,400	7.4	4.3-10.4	L
Grouped Counties				
Boone, Lincoln	4,100	11.2	7.9-14.6	H
Greenbrier, Summers, Monroe	4,700	9.7	7.3-12.0	H
Braxton, Nicholas, Webster	3,700	9.2	6.8-11.6	H
Hardy, Pendleton, Pocahontas	1,300	5.4	3.0-7.7	SL
Calhoun, Clay, Gilmer, Roane	4,200	13.3	8.9-17.6	H
Jackson, Wirt	2,400	9.1	5.8-12.3	H
Doddridge, Lewis, Ritchie	1,500	5.6	3.3-7.8	SL
Pleasants, Tyler, Wetzel	1,500	6.1	3.4-8.9	L
Barbour, Taylor	2,400	9.6	6.1-13.1	H
Preston, Tucker	2,300	7.9	4.8-11.1	L
Grant, Mineral	3,500	11.5	6.5-16.4	H
Hampshire, Morgan	2,800	9.2	6.0-12.4	H
Total WV (2006-2010)	123,100	8.7	8.1-9.1	

Data Source: Behavioral Risk Factor Surveillance System
Population: Adults age 18 and older
a. Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software and rounded to the nearest hundred.
c. H:higher but not significantly, L:lower but not significantly, SL: significantly lower; SH: significantly higher

Table 4. Adult Current Asthma[a] Prevalence by Age Group, West Virginia, 2007-2010												
Year	2007			2008			2009			2010		
	Number	%	95% CI	Number	%	95% CI	Number	%	95% CI	Number	%	95% CI
Age Group												
18-24	20,500	12.1	6.0-18.1	16,000	9.7	4.7-14.8	17,100	10.5	5.5-15.4	11,300	7.1	2.5-11.6
25-54	60,300	8.1	6.8-9.4	74,800	10.1	8.6-11.7	65,300	8.9	7.5-10.3	50,700	7.0	5.6-8.4
55+	48,200	9.3	8.0-10.6	46,900	9.0	7.7-10.3	43,100	8.2	7.1-9.3	41,000	7.7	6.6-8.8

Data Source: Behavioral Risk Factor Surveillance System
Population: West Virginia Adults age 18 and older
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 5. Adult Current Asthma[a] by Gender, 2007-2010, BRFSS						
West Virginia						
Year	Male			Female		
	Number[b]	%	95% CI	Number	%	95% CI
2007	48,200	6.9	5.4-8.4	81,400	11.0	9.4-12.5
2008	44,000	6.4	5.0-7.7	93,700	12.7	11.0-14.3
2009	41,600	6.0	4.6-7.4	84,000	11.4	10.0-12.8
2010	35,300	5.1	3.8-6.3	68,200	9.3	7.8-10.7
United States[c]						
Year	Male			Female		
	Number	%	95% CI	Number	%	95% CI
2007	6,936,000	6.2	6.0-6.5	11,842,100	10.1	9.8-10.3
2008	7,270,800	6.5	6.2-6.7	12,347,200	10.4	10.1-10.6
2009	7,333,400	6.4	6.2-6.7	12,394,300	10.3	
2010	7,405,000	6.5	6.2-6.7	12,912,400	10.7	10.4-10.9

Data Source: Behavioral Risk Factor Surveillance System
Population: West Virginia Adults age 18 and older
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. United States estimates include 50 states and District of Columbia.

Table 6. Adult Current Asthma[a] by Selected Characteristics, BRFSS						
Year	Low SES[b]			High SES[b]		
	Number[c]	%	95% CI	Number	%	95% CI
2007	20,400	18.4	14.0-22.8	102,500	7.9	6.8-9.1
2008	20,100	18.5	13.5-23.5	109,200	8.5	7.5-9.6
2009	15,500	16.1	11.9-20.2	102,000	7.9	6.9-8.9
2010	14,300	14.4	9.1-19.6	83,900	6.5	5.6-7.5
	Race/Ethnicity, 2006-2010					
	Number	%	95% CI	Number	%	95% CI
White, Nonhispanic	580,700	94.0	92.6-95.4	580,700	8.6	8.1-9.1
Black, Nonhispanic	9,000	1.5	0.8-2.1	9,000	7.2	4.0-10.3
Other[d], Nonhispanic	19,400	3.1	0.8-2.0	19,400	11.0	7.3-14.6
Hispanic	8,600	1.4	2.0-4.2	8,600	9.7	5.7-13.6

Data Source: Behavioral Risk Factor Surveillance System
Population: West Virginia Adults age 18 and older
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Low SES: income ≤$25,000 and education < high school diploma; higher SES: income >$25,000 and education ≥ high school diploma
c. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
d. Other race: Asian only, American Indian or Alaska Native only, Multiracial

Table 7. Lifetime[a] and Current Asthma[b] among Children, 2007-2010, BRFSS						
West Virginia						
Year	Lifetime Asthma			Current Asthma		
	Number[c]	%	95% CI	Number	%	95% CI
2007	51,300	13.7	11.3-16.0	38,300	10.2	8.1-12.3
2008	56,500	14.9	12.3-17.5	43,500	11.5	9.1-13.8
2009	47,500	12.7	10.5-14.9	31,600	8.5	6.6-10.4
2010	40,000	10.6	8.3-13.0	24,600	6.5	4.8-8.3
United States[d]						
Year	Lifetime Asthma			Current Asthma		
	Number[c]	%	95% CI	Number	%	95% CI
2007	59,800	13.5	13.0-14.1	59,600	8.9	8.5-9.4
2008	78,200	13.3	12.8-13.7	76,600	9.0	8.6-9.4
2009	74,300	13.2	12.8-13.7	74,000	8.6	8.2-9.0
2010	71,600	12.6	12.1-13.2	71,400	8.4	8.0-8.8

Data Source: Behavioral Risk Factor Surveillance System
Population: West Virginia Children age 17 and younger
a. Lifetime Asthma=Responding “yes” to “Has a doctor, nurse, or other health professional ever said that the child has asthma?”
b. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
c. Estimated number of children with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
d. United States estimates include 50 states and District of Columbia.

Table 8. Lifetime[a] and Current Asthma[b] among West Virginia Public Middle and High School Students, 2007-2011,YTS						
Lifetime Asthma						
Year	Middle School			High School		
	Number[c]	%	95% CI	Number	%	95% CI
2007	13,600	23.9	21.1-26.8	18,900	24.8	21.3-28.2
2009	12,300	22.1	20.4-23.9	19,300	25.2	23.5-26.8
2011	14,500	25.8	22.9-28.7	17,800	23.3	20.6-26.1
Current Asthma						
2007	7,300	13.6	11.9-15.3	10,100	14.1	11.6-16.6
2009	8,400	15.8	14.2-17.5	9,900	13.7	12.4-15.0
2011	10,000	18.5	15.9-21.0	10,500	14.3	12.5-16.2

Data Source: Youth Tobacco Survey
Population: West Virginia Public School Students, grades 6-12
a. Lifetime asthma: Responding "yes" to "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"
b Current asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?".
c. Estimated number of students with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred

Table 9. Current Asthma[a] by Gender: Children, BRFSS						
West Virginia						
Year	Male			Female		
	Number[b]	%	95% CI	Number	%	95% CI
2007	20,300	10.6	7.6-13.6	18,000	9.8	6.9-12.7
2008	25,900	13.2	9.6-16.8	17,600	9.6	6.6-12.6
2009	15,600	8.0	5.5-10.6	16,000	9.0	6.2-11.8
2010	13,600	7.0	4.5-9.5	11,100	6.0	3.8-8.3
United States[c]						
2007	30,700	10.1	9.5-10.8	28,700	7.7	7.1-8.4
2008	39,400	10.4	9.9-11.0	36,500	7.6	7.1-8.1
2009	37,900	9.6	9.0-10.2	35,600	7.6	7.1-8.1
2010	36,500	9.8	9.1-10.4	34,200	7.0	6.5-7.6

Data Source: Behavioral Risk Factor Surveillance System
Population: West Virginia Children age 17 and younger
a. Current Asthma=Responding "yes" to both "Has a doctor, nurse, or other health professional ever said that the child has asthma?" and "Do you still have asthma?"
b. Estimated number of children with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. United States estimates include 50 states and District of Columbia.

Table 10. Child Current Asthma[a] Prevalence by Age Group, West Virginia, 2007-2010												
Year	2007			2008			2009			2010		
	Number[b]	%	95% CI	Number	%	95% CI	Number	%	95% CI	Number	%	95% CI
Age Group												
5-9	13,600	13.5	9.0-18.0	15,300	14.9	9.6-20.2	10,500	10.0	6.5-15.0	6,300	3.9	3.1-9.3
10-14	14,600	13.6	9.2-18.0	15,100	14.6	10.2-18.9	10,600	12.0	8.3-16.9	9,500	9.6	5.3-13.8
15-17	6,000	9.0	4.7-13.2	7,900	11.5	5.4-17.6	7,300	10.9	6.8-17.0	4,800	6.9	4.2-11.3

Data Source: Behavioral Risk Factor Surveillance System
Population: West Virginia Children ages 17 and younger
a. Current Asthma=Responding "yes" to both "Has a doctor, nurse, or other health professional ever said that the child has asthma?" and "Do you still have asthma?"
b. Estimated number of children with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 11. Child Current Asthma[a] by Race, 2006-2010, BRFSS						
	Number[b]	%	95%CI	Number[b]	%	95%CI
White	125,000	91.1	87.6-94.7	125,000	8.9	7.9-9.9
Black	3,900	2.8	1.0-4.7	3,900	8.8	3.1-14.4
Other[c]	8,300	6.1	2.9-9.2	8,300	17.2	8.9-25.6

Data Source: Behavioral Risk Factor Surveillance System
Population: West Virginia Children age 17 and younger
a. Current Asthma=Responding "yes" to both "Has a doctor, nurse, or other health professional ever said that the child has asthma?" and "Do you still have asthma?"
b. Estimated number of children with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Other race: Asian, American Indian, Alaska Native, Other race

West Virginia
Asthma Burden Report
2007-2010

Issue 2: Health Care Access and Utilization

Bureau for Public Health
Health Statistics Center
350 Capitol Street, Room 165
Charleston, WV 25301

Earl Ray Tomblin, Governor
Karen L. Bowling, Cabinet Secretary

WEST VIRGINIA Department of Health & Human Resources

Preface

The West Virginia Asthma Education and Prevention Program (WV-AEPP) will publish issues of the *West Virginia Asthma Burden* as they are completed in order to get these data to you in a timely manner. This report is an update to *The Burden of Asthma in West Virginia* published in 2007 and is the most comprehensive source of information about asthma in the state. This report seeks to distribute information to WV-AEPP partners, health care providers, and public health professionals for the planning, development, and implementation of asthma-related activities.

Acknowledgements

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Health Care Access and Utilization

Health care access is defined as the ability to obtain medical care, typically measured by having health care coverage and the presence of a primary care provider. The use of medical care, including routine preventive visits and hospitalizations, help define health care utilization. Asthma hospitalizations reflect asthma control and may be the result of several factors including limited access to health care services, uncontrolled asthma conditions, or inadequate treatment practices[1].

West Virginia seniors (age 65 and older), adult female seniors, and males younger than age 15 were identified as priority populations in this issue, as they more frequently accessed health care systems in 2007-2010. In Issue 1, higher asthma prevalence was observed among adult females, as well as adults who have an annual household income below $25,000 and are not high school graduates (low socioeconomic status (SES)). For this reason, many topics in this issue are described according to these populations.

Definitions

The Behavioral Risk Factor Surveillance System (BRFSS) and the follow-up Asthma Callback Survey (ACS), which is linked to prior BRFSS responses, provide self-reported information about health care access, hospital, and emergency room visits. The West Virginia Health Care Authority (WV HCA) collects data and maintains a database on hospitalizations from all non-federal hospitals in the state. This database includes admittance and discharge information on asthma hospitalizations, which are identified based on diagnoses codes recorded by health care professionals (see Appendix A for additional information on data sources). The core module of the BRFSS administered among adults includes two questions about asthma:

(1) "Have you ever been told by a doctor, nurse or other health professional that you had asthma?"
(2) "Do you still have asthma?"

The BRFSS uses the following questions answered by an adult proxy to define asthma for West Virginia children age 17 and younger:

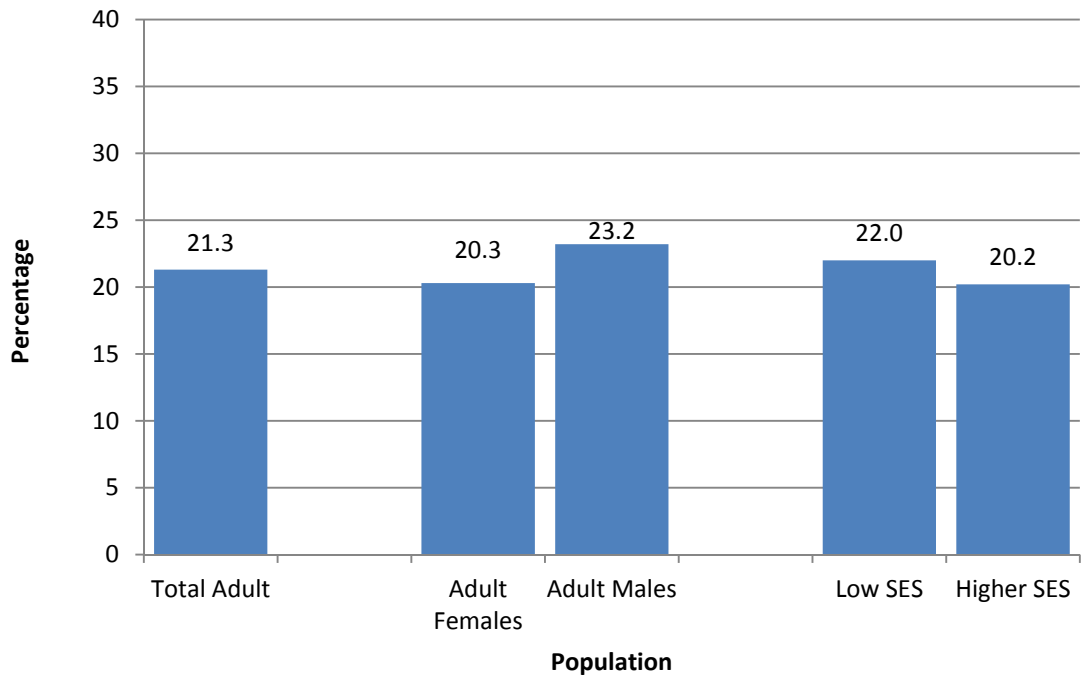
(1) "Has a doctor, nurse, or other health professional ever said that the child has asthma?"
(2) "Does the child still have asthma?"

Individuals are categorized as having current asthma when there is a "yes" response to the first and second question on the BRFSS.

Health Care Coverage

Health care coverage is an essential part of asthma management. In 2007-2010, more than 21,000 (21.3%) adults under age 65 with current asthma in West Virginia reported having no health care coverage (Figure 15). West Virginians age 65 and older were excluded from analysis, as they are eligible to receive Medicare benefits. Compared to adult males (23.2%), a lower percentage of adult females reported being uninsured in 2007-2010 (20.3%). West Virginia adults with current asthma of low SES reported having no insurance at a slightly higher rate than those of higher SES in 2007-2010 (22.0% compared to 20.2%). None of the health care coverage differences noted were statistically significant (see Appendix B for methodology).

Figure 15. Lack of Health Care Coverage, Adults with Current Asthma, West Virginia , 2007-2010

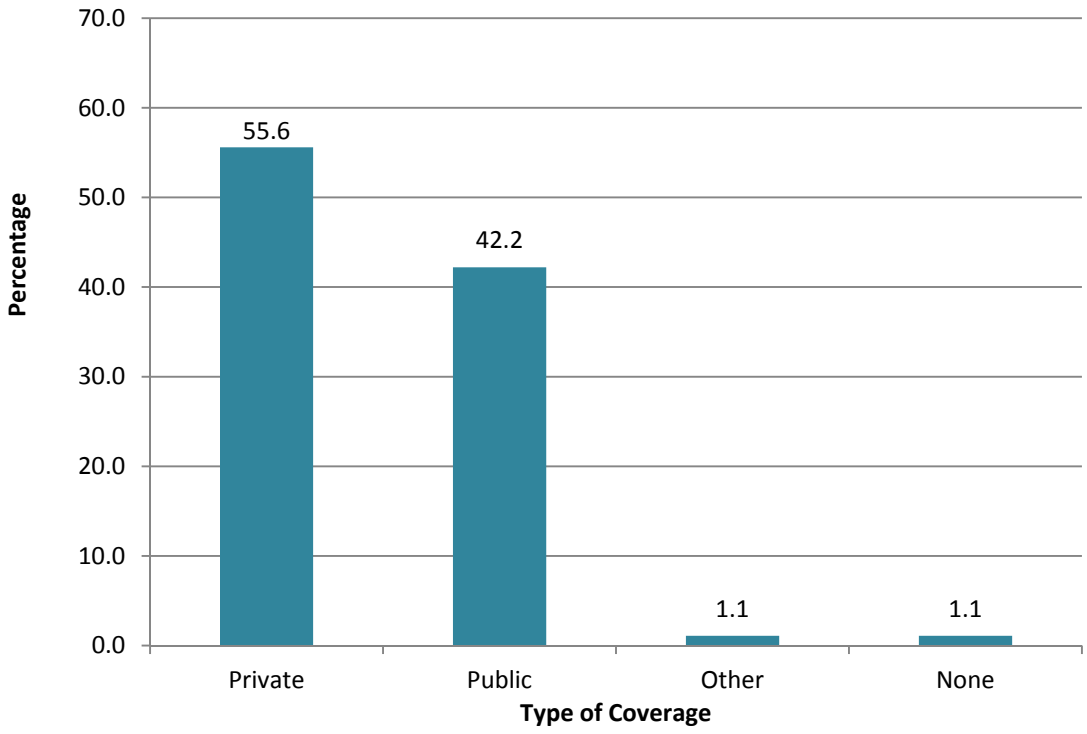


Data Source: Behavioral Risk Factor Surveillance System; West Virginia Health Statistics Center
Population: West Virginia Adults age 18-64
Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"
Low SES=income ≤$25,000 and education < high school diploma; higher SES=income >$25,000 and education ≥ high school diploma

Health Care Coverage among Children and Youth

According to the BRFSS ACS, in 2007-2010 the majority of West Virginia children age 17 and younger with current asthma had health care coverage (98.9%). Public programs such as Medicaid and West Virginia Children's Health Insurance Program (WV CHIP) exist to provide quality insurance, and strive to develop a health care system that allows all West Virginia children access to coverage[2]. Among children with current asthma, more than half had private coverage while just over 42% were insured through public programs (Figure 16).

Figure 16. Health Care Coverage among West Virginia Children with Current Asthma, 2007-2010

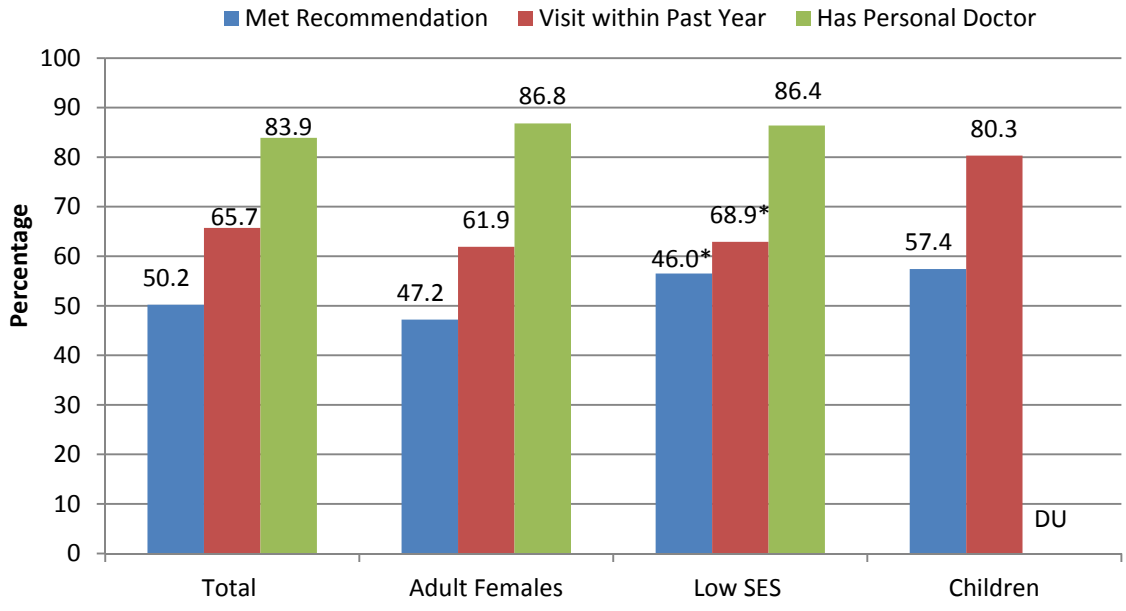


Data Source: Behavioral Risk Factor Surveillance System Asthma Callback Survey; West Virginia Health Statistics Center
Population: West Virginia children age 17 and younger
Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that [child's name] had asthma?" and "Does [he/she] still have asthma?"
Private: Parent's employer; Public: Medicare, Medicaid, West Virginia Children's Health Insurance Program (WV CHIP)

Routine Asthma Care

Individuals with asthma should see a provider for a routine asthma visit every six months according to the National Heart Lung and Blood Institute (NHLBI) guidelines for asthma management[3]. About half of West Virginians with current asthma reported meeting this recommendation in 2007-2010 (Figure 17). Adult females with current asthma reported having an asthma visit within the past year (61.9%) at a slightly higher percentage than their male counterparts in 2007-2010 (59.8%) and were statistically significantly more likely to have a personal doctor than males with current asthma (86.8% compared to 78.3%). Individuals with current asthma of low SES reported meeting NHBLI recommendations (56.5%) as well as having a personal doctor (86.4%) at slightly higher percentages than those with current asthma of higher SES in 2007-2010 (46.7%, 84.2%). Overall, children were statistically significantly more likely to report having an asthma visit within the past year than adults.

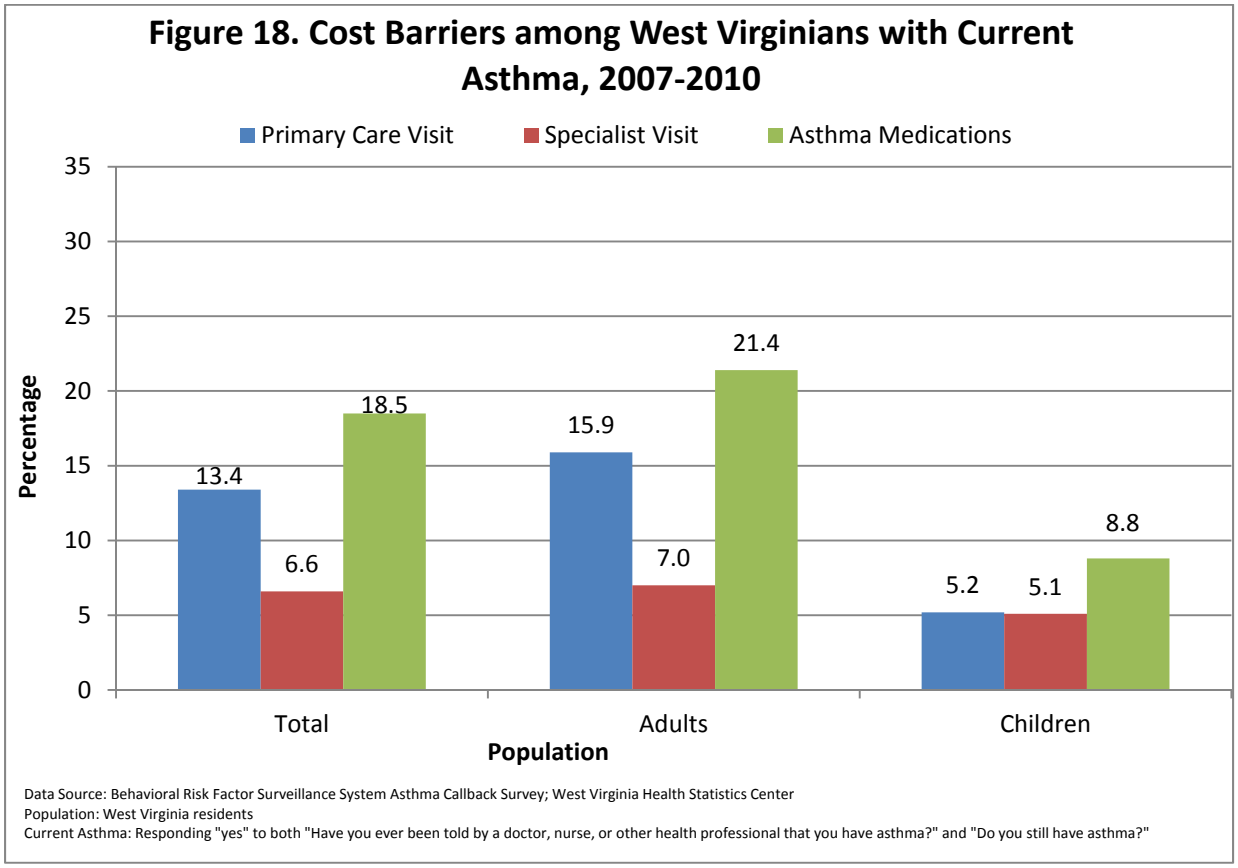
Figure 17. Routine Asthma Care among those with Current Asthma by Priority Population, West Virginia 2007-2010



Data Source: Behavioral Risk Factor Surveillance System Asthma Callback Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"
NHLBI Guidelines recommend 2 routine asthma visits every six months
* Use caution when interpreting this estimate, it does not meet one or more of the reliability criteria

Cost Barriers

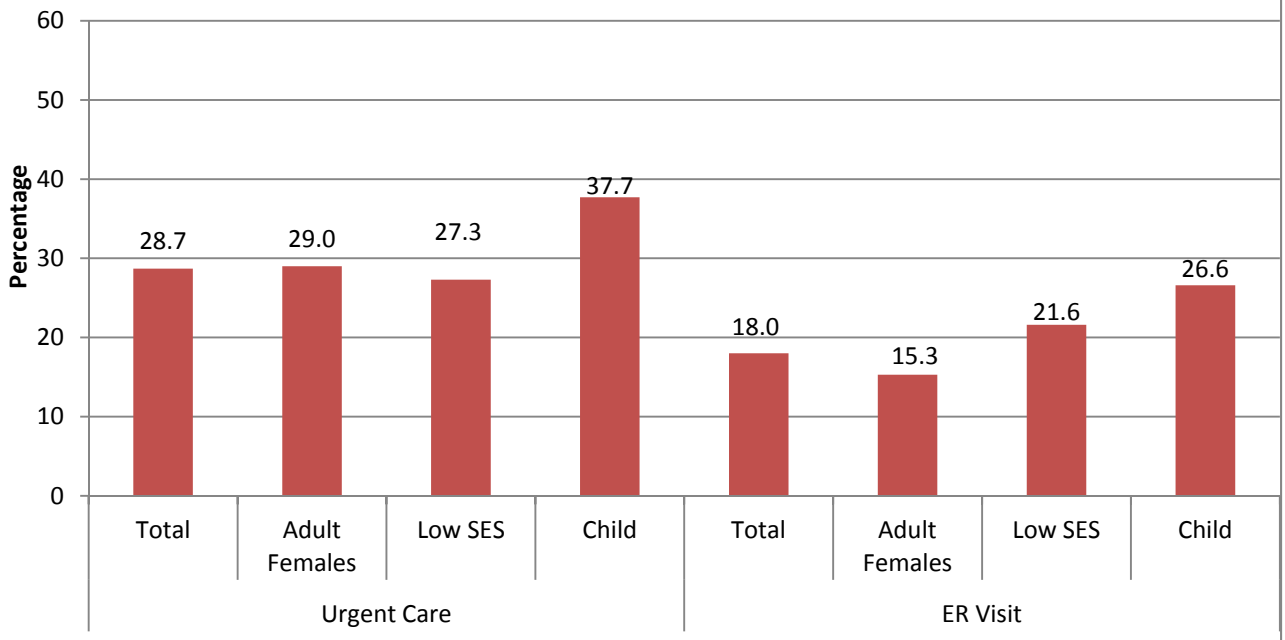
In 2007-2010, just over 13% of West Virginians with current asthma reported being unable to afford a primary care visit, 6.6% were unable to visit an asthma specialist due to cost, and 18.5% reported an inability to afford asthma medications (Figure 18). In 2007-2010, among West Virginia children with current asthma, 5.2% were unable to afford a primary care visit, 5.1% could not see an asthma specialist due to cost, and almost 9% did not have access to asthma medications because of the cost. Adults reported cost barriers more than children, likely due to public health care coverage programs implemented for children in the state.



Acute Asthma Care and Emergency Room Visits

Nearly 29% of West Virginians with current asthma reported seeking urgent treatment for worsening symptoms or an asthma episode in 2007-2010 (Figure 19). Eighteen percent of West Virginia residents with current asthma reported that they had visited an emergency room (ER) because of their asthma. Adult females and persons of low SES reported seeking urgent treatment related to asthma at slightly higher percentages than their counterparts (see Appendix C). No statistically significant differences were observed among any priority populations in 2007-2010. In 2007-2010, about 13,900 (37.7%) West Virginia children with current asthma sought urgent care for worsening symptoms according to the BRFSS ACS. Additionally, it was reported that more than a quarter of West Virginia children with current asthma were seen in the emergency room because of their asthma.

Figure 19. Acute Asthma Care Visits among those with Current Asthma, West Virginia, 2007-2010



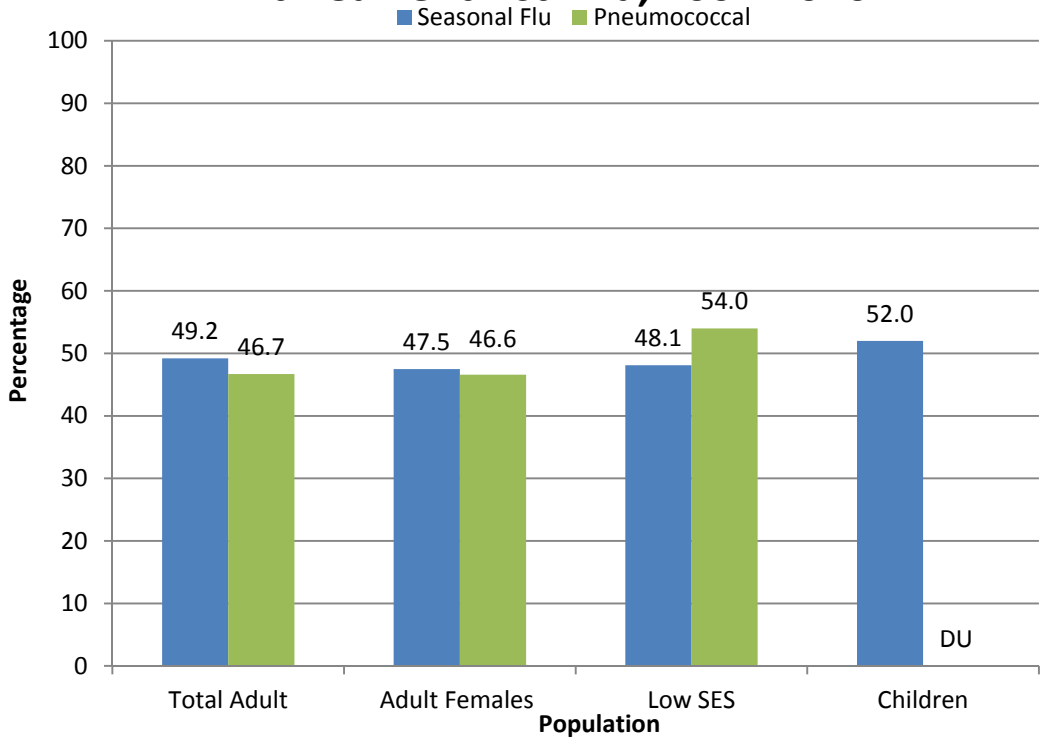
Data Source: Behavioral Risk Factor Surveillance System Asthma Callback Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Vaccinations

The Advisory Committee on Immunization Practices recommends that individuals with asthma get vaccinated against influenza (flu), as well as pneumococcal disease, because respiratory infections can be worse for those with asthma or increase frequency of asthma symptoms[4]. In 2007-2010, 49.2% of adults and 52% of children with current asthma reported receiving a flu vaccine (Figure 20). Adult females with current asthma reported flu vaccination at a percentage slightly higher than males (50.0% compared to 47.5%) while individuals of low SES reported lower percentage of vaccination than those of high SES in 2007-2010 (48.1% compared to 50.2%). None of these differences were statistically significant.

In 2007-2010, 46.7% of West Virginia adults with current asthma reported that they had received a pneumococcal disease vaccine within their lifetime. Adult females reported having received a pneumococcal vaccine at slightly lower percentages than their counterparts (46.6% compared to 47.1%) while individuals of low SES reported slightly higher vaccination in 2007-2010 (54.0% compared to 45.5%). These observations were not statistically significant.

Figure 20. Vaccinations among West Virginians with Current Asthma, 2007-2010



Data Source: Behavioral Risk Factor Surveillance System; West Virginia Health Statistics Center
Population: West Virginia residents
Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"
Low SES=income ≤$25,000 and education < high school diploma; higher SES=income >$25,000 and education ≥ high school diploma
DU: Data unavailable for West Virginia child population

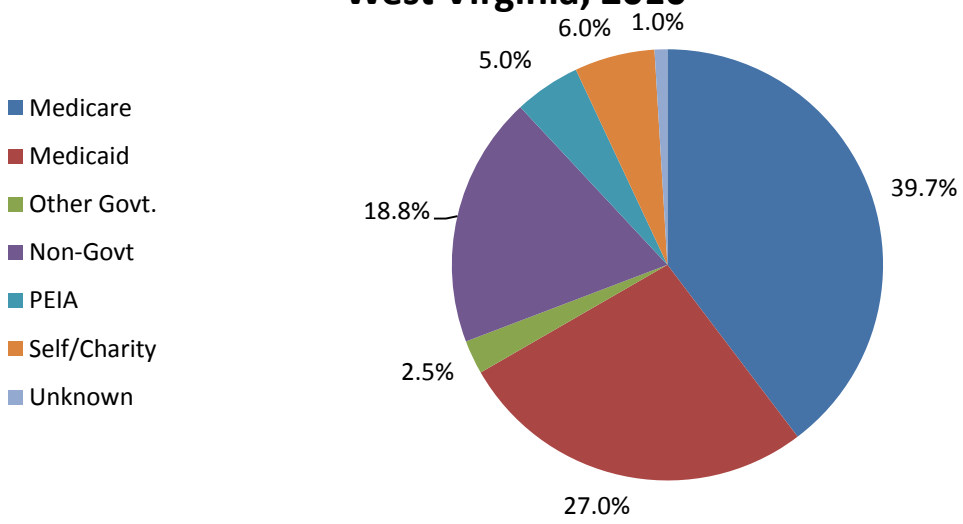
Asthma Hospitalizations

Asthma hospitalizations are defined as discharges with a primary diagnosis of asthma according to the International Classification of Diseases 9th Edition Clinical Modification (ICD-9-CM) code 493. Out of state residents who were hospitalized in West Virginia and state residents who were hospitalized in other states are not included in the analysis. Data on asthma hospitalizations are useful in the identification of priority groups who can benefit from education on proper disease care and management.

Economic Burden

According to the BRFSS ACS in 2007-2010, 7.0% (11,400) of West Virginians with current asthma reported staying overnight in a hospital because of their asthma. In 2010, according to the WV HCA hospitalizations discharge database, asthma hospitalization charges totaled more than $29,172,800. About two-thirds of claims were paid through Medicare and Medicaid (Figure 21) which was 1,813 of the 2,719 claims for the year.

Figure 21. Asthma Hospitalization by Payor Group, West Virginia, 2010

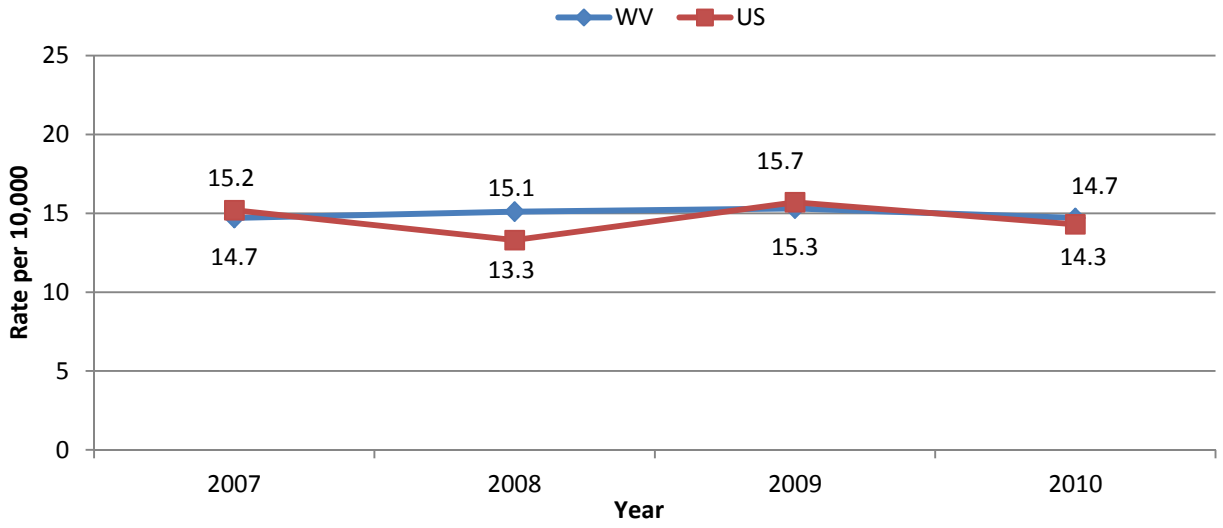


Data Source: West Virginia Health Care Authority; West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma hospitalizations=Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.
PEIA: Public Employees Insurance Agency

Asthma Hospitalization Rates

The peak asthma hospitalization rate was in 2009 for the United States and West Virginia (15.7 and 15.3 respectively). In the US, asthma hospitalization rates decreased overall from 2007 to 2010 (15.2 to 14.3) while remaining the same in West Virginia. Asthma hospitalization rates for West Virginia were marginally lower than US rates in 2007 (14.7 compared to 15.2) and 2009 (15.3 compared to 15.7).

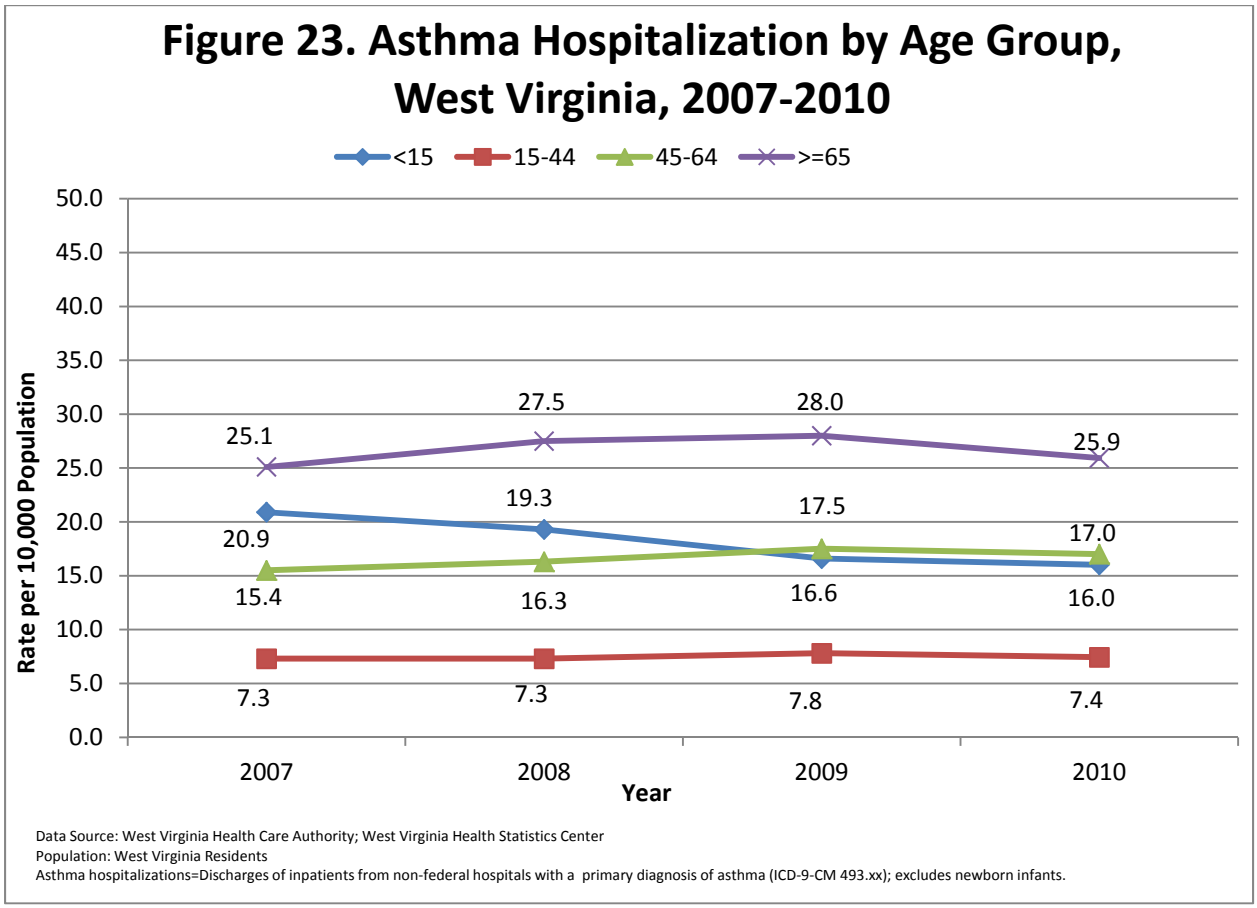
Figure 22. Asthma Hospitalization Rates: West Virginia and United States, 2007-2010



Data Source: National Hospital Discharge Survey, West Virginia Health Care Authority; West Virginia Health Statistics Center
Asthma hospitalizations=Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

Age

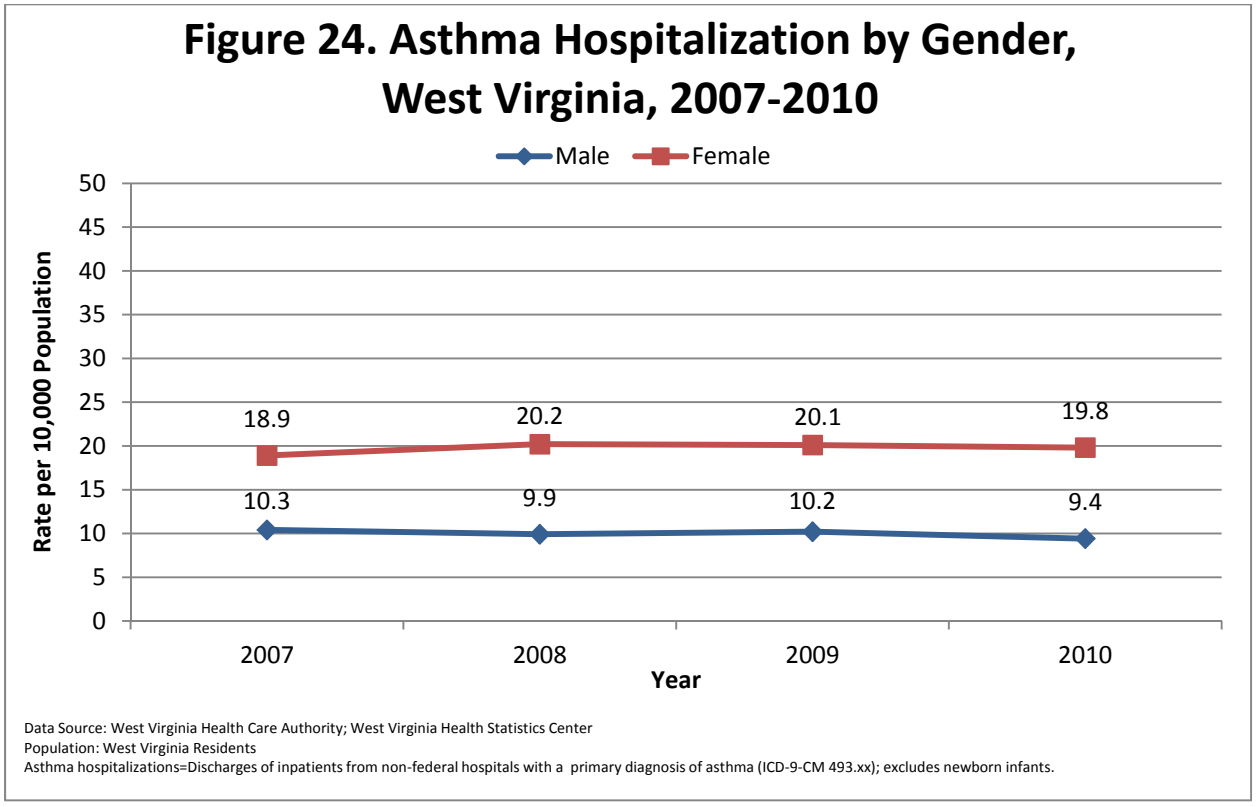
West Virginia seniors, those aged 65 and older, consistently had a higher hospitalization rate than any other age group. Individuals aged 15-44 were hospitalized at the lowest rate each year, which was about 1/3 of the rate of asthma hospitalizations among seniors. Children younger than 15 had a higher hospitalization rate than individuals aged 15-44 and 45-64 in 2007-2008. In 2009-2010, however, those with asthma younger than 15 were hospitalized at a rate slightly lower than those aged 45-64.



Data Source: West Virginia Health Care Authority; West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma hospitalizations=Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

Gender

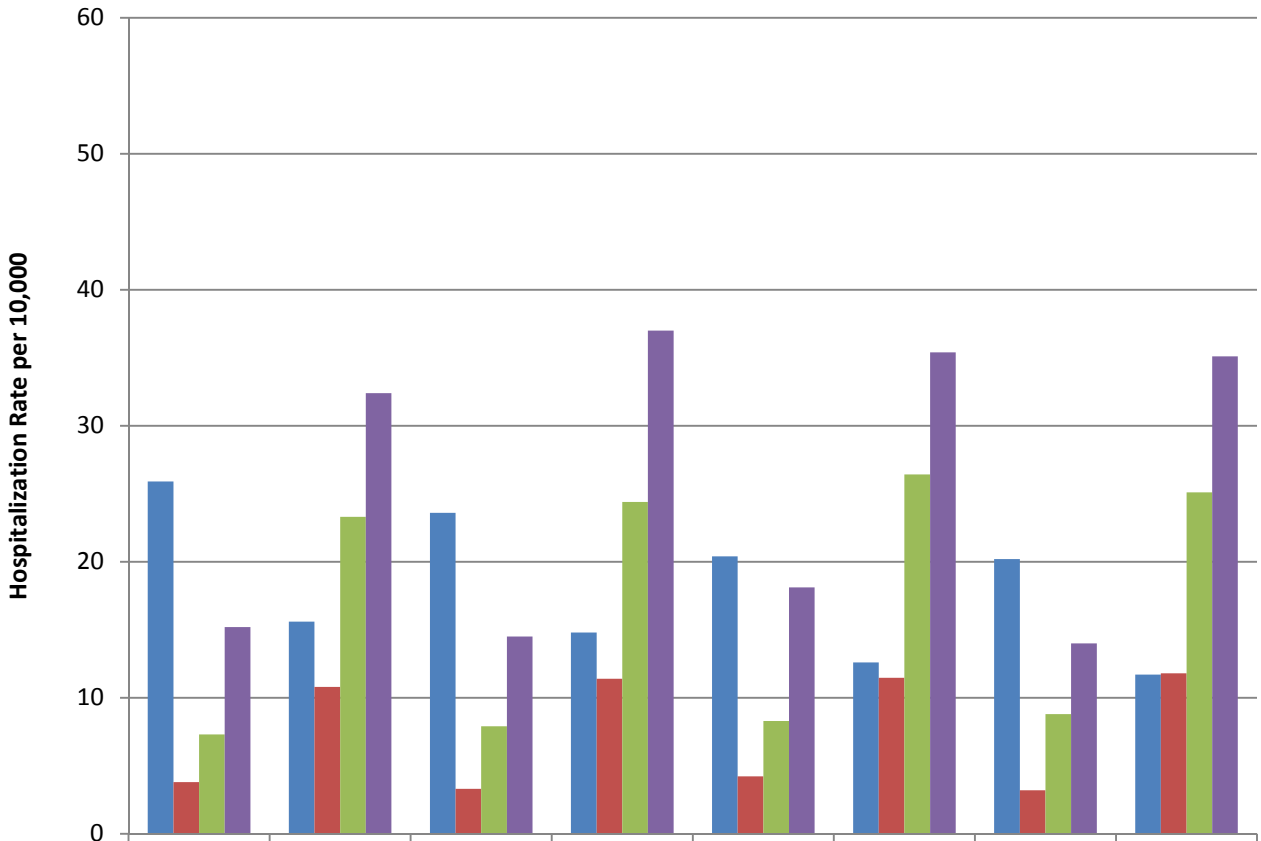
In 2010, there were 1,860 hospitalizations among females and 859 among males (see Appendix C). The hospitalization rate for females with a primary diagnosis of asthma was higher than that of males each year (Figure 24). In 2010, the hospitalization rate for females was more than twice that of males (19.8 compared to 9.4).



Age and Gender

After age 14, hospitalization rates were higher for females than for males. Among males hospitalized for asthma, those aged 15-44 consistently had the lowest hospitalization rate (see Appendix C for detailed tables). Female seniors in West Virginia had the highest hospitalization rates each year overall, which were at least double that of their male counterparts in every year except 2009. The hospitalization rate of females younger than 15 decreased yearly, while hospitalizations slightly increased among males aged 45-64 annually.

Figure 25. Asthma Hospitalizations by Age and Gender, West Virginia, 2007-2010



	2007		2008		2009		2010	
	Male	Female	Male	Female	Male	Female	Male	Female
<15	25.9	15.6	23.6	14.8	20.4	12.6	20.2	11.7
15-44	3.8	10.8	3.3	11.4	4.2	11.5	3.2	11.8
45-64	7.3	23.3	7.9	24.4	8.3	26.4	8.8	25.1
>=65	15.2	32.4	14.5	37.0	18.1	35.4	14.0	35.1

Data Source: West Virginia Health Care Authority; West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma hospitalizations=Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.

References

1. Centers for Disease Control and Prevention. (2013, January 10). *Flu and People with Asthma*. Retrieved February 15, 2013, from Seasonal Influenza (Flu) - Information for People with Asthma: http://www.cdc.gov/flu/asthma/

2. Medicaid Health Plans of America Center for Best Practices. (2011). *Best Practices Compendium in Childhood Asthma Care.* Washington, DC: MHPA.

3. US Department of Health and Human Services - National Institutes of Health: National Heart, Lung and Blood Institute. (2007). *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma.* Bethesda: NHLBI Health Information Center.

4. West Virginia Department of Health and Human Resources. (2013). *Benefit Details*. Retrieved July 10, 2013, from West Virginia Children's Health Insurance Program: http://www.benefits.gov/benefits/benefit-details/1375

Appendix A: Data Sources

Behavioral Risk Factor Surveillance System (BRFSS): The BRFSS survey is a state-based, ongoing, random-digit-dialed telephone survey of civilian, non-institutionalized adults ages 18 and older who live in the United States. Data on several topics are collected using the BRFSS, which allows for analysis of associations between various behaviors and asthma. The collection of these data has been occurring in a standard and reliable format for more than 25 years, allowing for analysis of time trends. Also, whereas a standard methodology is used in all states, state-to-state comparisons are possible. More recently, the BRFSS has been expanded to include more cell phone surveys. BRFSS data must be interpreted with caution as data are self-reported. Additionally, individuals may have difficulty recalling past behaviors or may understate behaviors known to be unhealthy, socially unacceptable, or illegal.

Since 2007, the BRFSS Asthma Call-back Survey (BRFSS ACS) was implemented in West Virginia as a follow-up to the BRFSS survey. Only one adult or child per household can participate in the ACS, which obtains in-depth information about asthma symptoms, episodes/attacks, self-management education, health care utilization and access, medication use, comorbidities, and environmental allergens and irritants. For additional information visit: http://www.cdc.gov/brfss/. In order to maintain a level of consistency with our data reporting throughout the *Asthma Burden*, the data presented here begins in 2007.

Hospital Discharge Database: The West Virginia Health Care Authority (WV HCA) collects data on hospitalizations from all non-federal hospitals in the state. The Hospital Discharge Database includes information on admittance and discharge dates; patient characteristics such as age, gender, county of residence and marital status; diagnoses codes; length of stay; facility; and payor. Asthma hospitalizations are identified based on diagnoses codes recorded by health care professionals. The WV HCA then uses this information to constrain the rising cost of health care and to assure reasonable access to necessary health services.

This database contains information from virtually all hospitals in the state including general acute care, psychiatric and rehabilitation hospitals. However, the database does not include information on patient race or ethnicity. Additionally, hospitalizations from the Veteran's Administration hospitals in the state are not included in this database. For additional information, visit www.hcawv.org.

Appendix B: Methodology

Multiple years of data were combined to create consistency between the BRFSS and BRFSS ACS. The number of individuals reported in tables (Appendix C) was an estimate for the midpoint of the specified timeframe.

95% Confidence Interval (95% CI): Confidence Intervals represent the range of values among which the true value would be found. This report presents the 95% CI, meaning that the true value would be within the given interval 95% of the time. Confidence intervals are mainly affected by the number of responses or events that the estimate is based on. If there are a small number of responses, the estimate will typically have large confidence intervals.

Rate: Rates are calculated by dividing the number of events in a given time period by the number of people at risk of experiencing the event in that time period. Percentages are rates presented as per 100 population.

Statistically Significant: In this report, rates are said to be statistically significant when the 95% CI associated with each of the rates does not overlap. It can be stated with 95% certainty that the difference found between the two rates is not a random occurrence.

Trends Data: Much of the data presented here represents 2007-2010 to provide consistency across chapters, as the BRFSS ACS was implemented in West Virginia in 2007. Additionally, the previous *Burden of Asthma in West Virginia* described surveillance data for the state up to 2006 and can be found at http://www.dhhr.wv.gov/hpcd/programs/wvasthma/Pages/AsthmaBurdenReport.aspx beginning May 1, 2013.

Based on CDC recommendations, estimates in this report were termed unreliable if any of the three following conditions were met:
(1) The estimate is based on responses from fewer than 50 respondents in the subsample or denominator of the prevalence estimate calculation.
(2) The 95% confidence interval of the estimate has a width or range greater than 20 (e.g., 95% CI = 10.0-30.5).
(3) The estimate has a relative standard error (RSE) of 30.0% or higher. The RSE is obtained by dividing the standard error of the estimate by the estimate itself. It is calculated by the SAS software, a commonly used statistical software package.

Appendix C: Detailed Tables

Table 1. Lack of Health Care Coverage among Adults with Current Asthma[a] by Selected Characteristics, West Virginia, 2007-2010, BRFSS		
	Number[b]	% (95% CI)
Adult Females	13,600	20.3 (16.5-24.1)
Adult Males	7,700	23.2 (16.5-29.9)
Low SES[c]	2,700	22.0 (14.2-29.7)
Higher SES[c]	16,700	20.2 (16.4-23.9)
Total Adult	21,300	21.3 (17.9-24.7)

Data Source: Behavioral Risk Factor Surveillance System, West Virginia Health Statistics Center
Population: West Virginia Adults age 18-64
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Low SES: income ≤$25,000 and education < high school diploma; high SES: income >$25,000 and education ≥ high school diploma

Table 2. Health Care Coverage among Children with Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS		
	Number[b]	% (95% CI)
Private[c] Health Care Coverage	21,100	55.6 (47.4-63.8)
Public[c] Health Care Coverage	16,000	42.2 (34.0-50.5)
Other Health Care Coverage	400	1.1 (0.0-2.6)
Lack of Coverage	400	1.1 (0.1-2.1)

Data Source: Behavioral Risk Factor Surveillance System, Asthma Callback Survey, West Virginia Health Statistics Center
Population: West Virginia Children age 17 and younger
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of children with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Private: Parent's employer; Public: Medicare/Medicaid, West Virginia Children's Health Insurance Program (WV CHIP)

Table 3. Routine Asthma Care, West Virginians with Current Asthma[a], 2007-2010, BRFSS and BRFSS ACS						
	Met Recommendation[b]		**Visit in Past Year**		**Has Personal Doctor**	
	Number[c]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Total[d]	81,000	50.2 (46.3-54.1)	105,900	65.7 (61.9-69.4)	104,100	83.9 (81.3-86.6)
Adult Females	38,300	47.2 (42.1-52.4)	50,200	61.9 (56.7-67.1)	71,000	86.8 (84.0-89.7)
Adult Males	21,000	49.5 (41.1-57.9)	25,400	59.8 (51.6-68.1)	33,100	78.3 (72.9-83.7)
Low SES[e]	9,400	56.5* (46.1-67.0)	10,500	62.9 (52.5-73.3)*	15,200	86.4 (81.2-91.6)
High SES[e]	47,300	46.7 (41.7-51.7)	62,300	61.5 (56.6-66.4)	83,600	84.2 (81.1-87.2)
Children	21,600	57.4 (49.6-65.1)	30,300	80.3 (74.4-86.2)	DU	

Data Source: Behavioral Risk Factor Surveillance System, Asthma Callback Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. National Heart Lung and Blood Institute recommends 2 routine asthma visits annually
c. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
d. Total for "No Personal Doctor" excludes child population because this data is unavailable for children.
e. Low SES: income ≤$25,000 and education < high school diploma; high SES: income >$25,000 and education ≥ high school diploma
DU: Data unavailable

Table 4. Urgent Asthma Visits, West Virginians with Current Asthma[a], 2007-2010, BRFSS ACS						
	Urgent Visit		**ER Visit**		**Overnight Hospital Stay**	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Total	46,300	28.7 (25.2-32.3)	29,400	18.0 (15.0-21.0)	11,400	7.0 (5.0-9.1)
Adult Females	23,400	29.0 (24.4-33.6)	12,500	15.3 (11.8-18.8)	4,400	5.4 (3.8-7.1)
Adult Males	9,000	20.7 (13.0-28.3)	6,800	15.5 (9.6-21.3)	3,100	7.1 (3.0-11.2)
Low SES[c]	4,600	27.3 (18.1-36.5)	3,700	21.6 (13.1-30.2)	1,500	8.8 (2.1-15.5)
High SES[c]	26,300	25.8 (21.3-30.2)	14,900	14.5 (11.1-17.9)	5,700	5.6 (3.7-7.4)
Children	13,900	37.7 (29.8-45.6)	10,100	26.6 (19.1-34.1)	3,900	10.4 (3.9-16.9)

Data Source: Behavioral Risk Factor Surveillance System, Asthma Callback Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Low SES: income ≤$25,000 and education < high school diploma; high SES: income >$25,000 and education ≥ high school diploma

Table 5. Cost Barriers among those with Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Adults		Children		Total	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Primary Visit	19,900	15.9 (12.5-19.2)	2,000	5.2 (1.7-8.8)	21,900	13.4 (10.7-16.1)
Specialist Visit	8,800	7.0 (4.8-9.3)	1,900	5.1 (1.2-8.9)	10,700	6.6 (4.7-8.5)
Asthma Medications	26,800	21.4 (17.7-25.2)	3,300	8.8 (4.5-13.1)	30,200	18.5 (15.4-21.6)

Data Source: Behavioral Risk Factor Surveillance System, Asthma Callback Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of residents with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 6. Vaccinations among West Virginians with Current Asthma[a], 2007-2010, BRFSS and BRFSS ACS				
	Seasonal Flu		Pneumococcal Disease	
Population	Number[b]	% (95%CI)	Number	% (95% CI)
Adult Females	40,800	50.0 (46.3-53.7)	36,900	46.6 (42.9-50.2)
Adult Males	20,100	47.5 (41.8-53.3)	19,100	47.1 (41.3-52.9)
Low SES[c]	8,500	48.1 (40.5-55.7)	9,400	54.0 (46.1-61.9)
High SES[c]	49,800	50.2 (46.6-53.7)	43,600	45.5 (42.0-49.0)
Total Adult[d]	60,900	49.2 (46.0-52.3)	56,100	46.7 (43.6-49.9)
Children	19,700	52.0 (44.2-59.9)	DU	

Data Source: Behavioral Risk Factor Surveillance System, Asthma Callback Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma=Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Low SES: income ≤$25,000 and education < high school diploma; higher SES: income >$25,000 and education ≥ high school diploma
d. Total excludes children, child data was retrieved using a separate survey
DU: Data unavailable
*Use caution interpreting this estimate. It does not meet one or more reliability criteria.

Table 7. Hospitalizations Claims Data by Payor Group, West Virginia, 2010, WV HCA		
Payor	Number of Claims	Percentage
Medicare	1079	39.7
Medicaid	734	27.0
Other Government	69	2.5
Non-Government	512	18.8
PEIA	135	5.0
Self/Charity	164	6.0
Other	0	0.0
Unknown	26	1.0
Total	2719	100

Data Source: West Virginia Health Care Authority, West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma hospitalizations=Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.
PEIA: Public Employees Insurance Agency

Table 8. Asthma Hospitalizations by Age Group, West Virginia, 2007-2010, WV HCA								
Year	2007		2008		2009		2010	
Age Group	# of Hospitalizations	Rate	# of Hospitalizations	Rate	# of Hospitalizations	Rate	# of Hospitalizations	Rate
<15	661	20.9	612	19.3	528	16.6	511	16.0
15-44	511	7.3	512	7.3	544	7.8	517	7.4
45-64	789	15.4	838	16.3	905	17.5	920	17.0
65+	705	25.1	783	27.5	805	28.0	771	25.9
Total	2666	14.7	2745	15.1	2782	15.3	2719	14.7

Data Source: West Virginia Health Care Authority, West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma hospitalizations=Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.
a. Rate per 10,000 population

Table 9. Asthma Hospitalizations by Gender, West Virginia, 2007-2010, WV HCA				
	Male		Female	
Year	# of Hospitalizations	Rate[a]	# of Hospitalizations	Rate
2007	918	10.3	1748	18.9
2008	877	9.9	1868	20.2
2009	914	10.2	1868	20.1
2010	859	9.4	1860	19.8

Data Source: West Virginia Health Care Authority, West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma hospitalizations=Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.
a. Rate per 10,000 population

Table 10. Asthma Hospitalizations by Age and Gender, West Virginia, 2007-2010, WV HCA								
	2007		2008		2009		2010	
	Male	Female	Male	Female	Male	Female	Male	Female
Age Group	# of Hospitalizations (Rate[a])	# of Hospitalizations (Rate)	# of Hospitalizations (Rate)	# of Hospitalizations (Rate)	# of Hospitalizations (Rate)	# of Hospitalizations (Rate)	# of Hospitalizations (Rate)	# of Hospitalizations (Rate)
<15	420 (25.9)	241 (15.6)	383 (23.6)	229 (14.8)	332 (20.4)	196 (12.6)	329 (20.2)	182 (11.7)
15-44	134 (3.8)	377 (10.8)	118 (3.3)	394 (11.4)	149 (4.2)	395 (11.5)	114 (3.2)	403 (11.8)
45-64	183 (7.3)	606 (23.3)	200 (7.9)	638 (24.4)	210 (8.3)	695 (26.4)	234 (8.8)	686 (25.1)
65+	181 (25.1)	524 (32.4)	176 (14.5)	607 (37.0)	223 (18.1)	582 (35.4)	182 (14.0)	589 (35.1)

Data Source: West Virginia Health Care Authority, West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma hospitalizations=Discharges of inpatients from non-federal hospitals with a primary diagnosis of asthma (ICD-9-CM 493.xx); excludes newborn infants.
a. Rate per 10,000 population

West Virginia
Asthma Burden Report
2007-2010

Issue 3: Asthma Deaths

Bureau for Public Health
Health Statistics Center
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Charleston, WV 25301

Earl Ray Tomblin, Governor
Karen L. Bowling, Cabinet Secretary

WEST VIRGINIA Department of Health & Human Resources

Preface

The West Virginia Asthma Education and Prevention Program (WV-AEPP) will publish issues of the *West Virginia Asthma Burden* as they are completed in order to get these data to you in a timely manner. This report is an update to *The Burden of Asthma in West Virginia* published in 2007 and is the most comprehensive source of information about asthma in the state. This report seeks to distribute information to WV-AEPP partners, health care providers, and public health professionals for the planning, development, and implementation of asthma-related activities.

Acknowledgements

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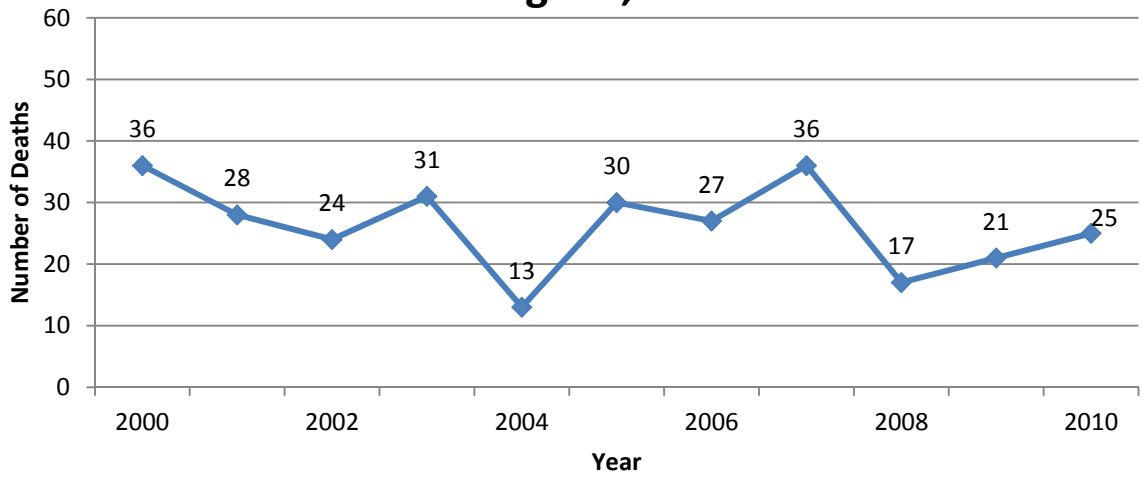
Asthma Deaths

Deaths due to asthma rarely occur because proper disease management allows people with asthma to lead healthy and active lives. However, in 2010 there were more than 3,400 asthma related deaths in the United States, a rate of about 11 deaths per million United States residents[1]. In this issue, seniors (individuals age 65 and older) as well as females were identified as priority populations in West Virginia because they were more likely to die from asthma.

The cause of death is coded using information contained in the death certificate, which is completed by the attending physician. In 1999, the *Tenth Revision of the International Classification of Diseases Adapted for Use in the United States* (ICD-10) was adopted by the National Center for Health Statistics (NCHS) and the World Health Organization. Asthma deaths are defined as deaths with a primary diagnosis of asthma, ICD-10 codes J45-J46. In West Virginia, this information is collected by the Vital Registration Office of the West Virginia Health Statistics Center. National death rates were obtained from NCHS reports and the CDC Wonder online data system. See Appendix A for a discussion of the methodologies and limitations of death data.

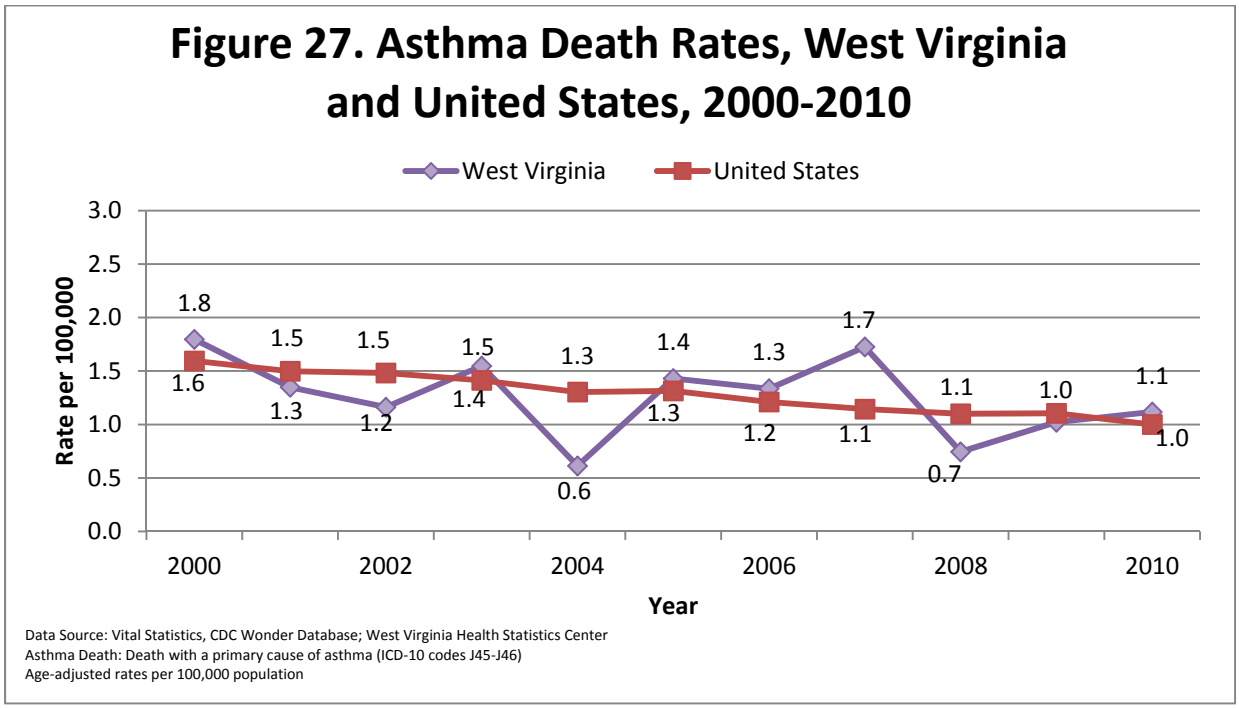
Since 2000, a total of 288 West Virginia residents have died because of asthma, an average of about 29 deaths per year including the 25 that occurred in 2010 (Figure 26). The peak number of asthma deaths (36) occurred in 2000 and 2007, with the fewest (13) in 2004.

Figure 26. Number of Asthma Deaths, West Virginia, 2000-2010



Data Source: Vital Statistics, West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma Death: Death with a primary cause of asthma (ICD-10 codes J45-J46)

In the United States the average age-adjusted asthma death rate in 2000-2010 was 1.3 per 100,000 individuals. This measure was slightly lower in West Virginia, 1.2 deaths per 100,000. Since 2000, the age adjusted death rate has decreased overall in West Virginia and in the United States (Figure 27). West Virginia asthma death rates were higher than the national rate in 2000, 2003, 2005-2007, and 2010.

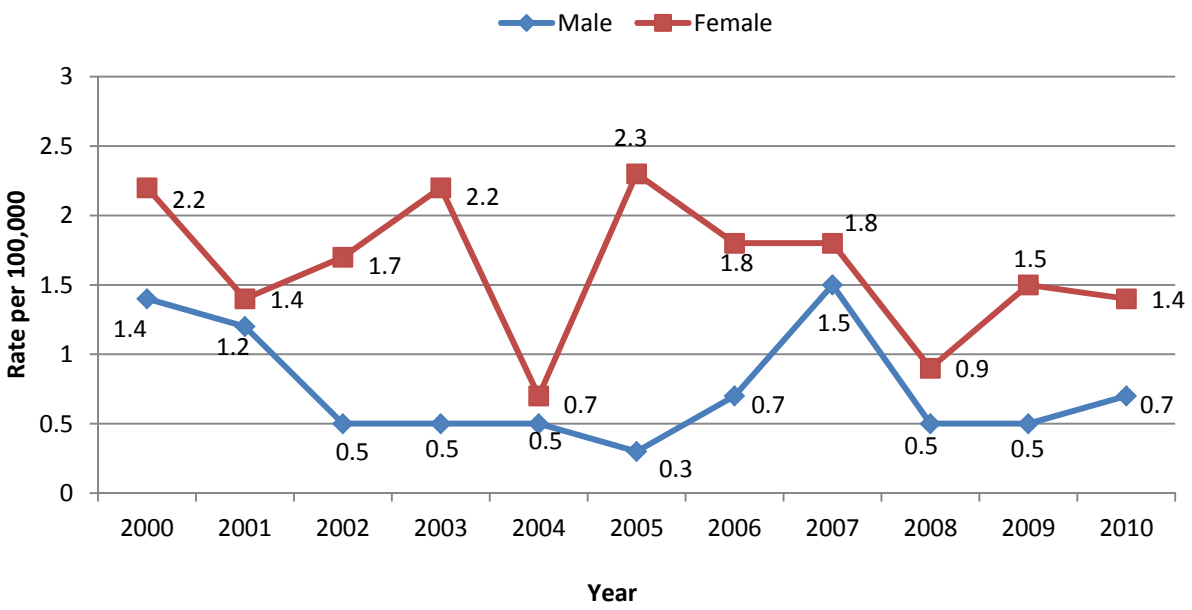


Age and Gender

In 2000-2010 there were 129 asthma deaths among individuals younger than 65, and 159 deaths among West Virginia seniors. Using a life expectancy of 75, these deaths resulted in an estimated 4,318 years of potential life lost, or about 24 years per person.

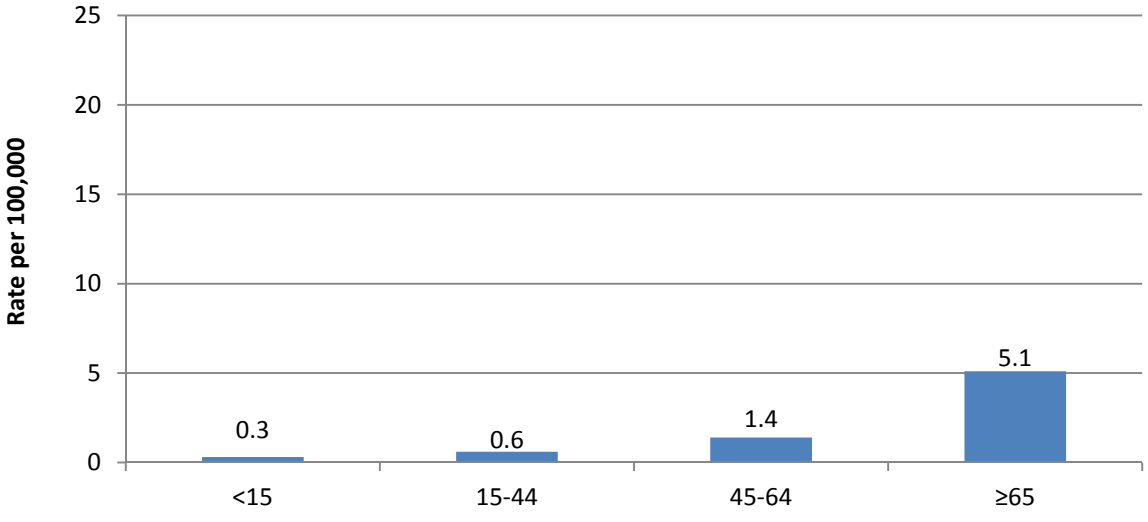
The age adjusted death rates were consistently higher for females than males in West Virginia (Figure 28), and this is similar to nationwide asthma death trends. In 2000-2010 the age-adjusted death rate was statistically significantly higher for females, 2.0 compared to 0.9 for males. The risk of death due to asthma increases with age. West Virginia seniors were statistically significantly more likely to die of asthma than all other age groups (Figure 29). Gender differences increased with age, as female seniors in West Virginia died at a rate nearly three times higher than males (Figure 30). This observation was also statistically significant.

Figure 28. Age-Adjusted Asthma Death Rates by Gender, West Virginia, 2000-2010



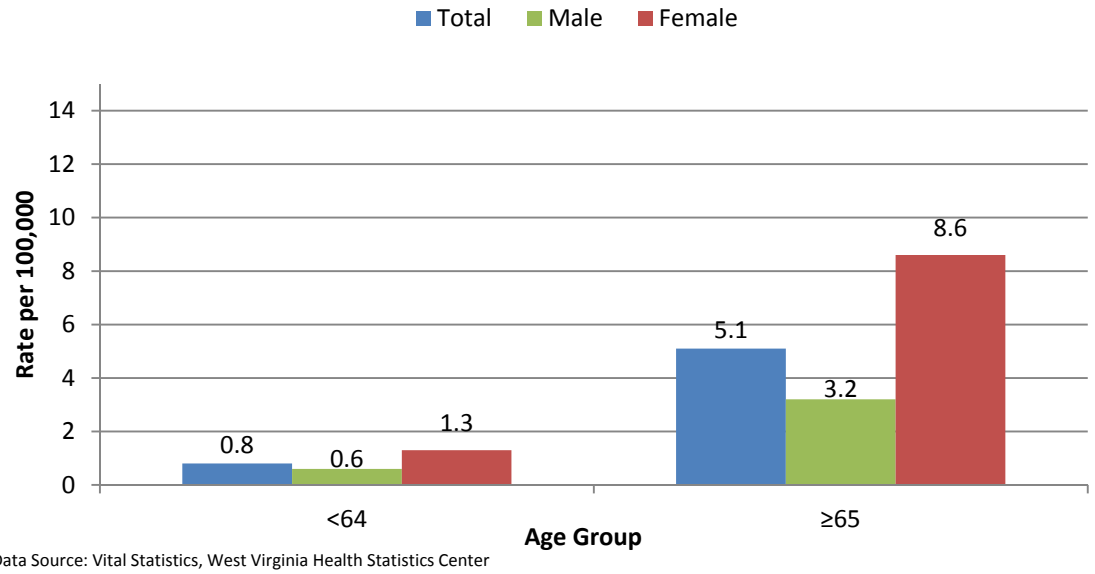
Data Source: Vital Statistics, West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma Death: Death with a primary cause of asthma (ICD-10 codes J45-J46)

Figure 29. Asthma Death Rates by Age, West Virginia, 2000-2010



Data Source: Vital Statistics, West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma Death: Death with a primary cause of asthma (ICD-10 codes J45-J46)

Figure 30. Asthma Death Rates by Age Groups, West Virginia, 2000-2010



Data Source: Vital Statistics, West Virginia Health Statistics Center
Population: West Virginia Residents
Asthma Death: Death with a primary cause of asthma (ICD-10 codes J45-J46)

Appendix A: Data Sources

Vital Statistics: Information on deaths in West Virginia and the United States is obtained from vital records. Vital records include information that is collected on death certificates, such as demographic characteristics of the deceased as well as the cause and manner of death. These records are collected, verified, and stored by the West Virginia Health Statistics Center of the West Virginia Department of Health and Human Resources. The National Vital Statistics System is managed by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention. State vital records are collected and compiled by NCHS. Death counts are very accurate and have been collected by states using standards outlined by NCHS. Virtually all deaths in West Virginia and the United States are reported. The cause of death is reported on death certificates by medical professionals using codes and rules outlined in the International Classification of Diseases (ICD) developed by the World Health Organization. ICD codes are reviewed and revised periodically. For additional information, visit http://www.wvdhhr.org/bph/hsc/

Appendix B: Methodology

95% Confidence Interval (95% CI): Confidence Intervals represent the range of values among which the true value would be found. This report presents the 95% CI, meaning that the true value would be within the given interval 95% of the time. Confidence intervals are mainly affected by the number of responses or events that the estimate is based on. If there are a small number of responses, the estimate will typically have large confidence intervals.

Rate: Rates are calculated by dividing the number of events in a given time period by the number of people at risk of experiencing the event in that time period. Percentages are rates presented as per 100 population.

Statistically Significant: In this report, rates are said to be statistically significant when the 95% CI associated with each of the rates does not overlap. It can be stated with 95% certainty that the difference found between the two rates is not a random occurrence.

Estimates in this issue were deemed unreliable when based on fewer than 20 deaths.

Appendix C: Detailed Tables

Table 1. Age-Adjusted Asthma Death Rates, West Virginia and United States, 2000-2010					
Year	West Virginia			United States	
	Deaths[a]	Rate[b]	95% CI[c]	Deaths	Rate
2000	36	1.8	1.3-2.5	4,487	1.6
2001	28	1.3	0.9-1.9	4,269	1.5
2002	24	1.2	0.8-1.8	4,261	1.5
2003	31	1.5	1.0-2.1	4,099	1.4
2004	13	0.6*	0.3-1.0	3,816	1.3
2005	30	1.4	0.9-2.0	3,884	1.3
2006	27	1.3	0.9-1.9	3,613	1.2
2007	36	1.7	1.2-2.4	3,447	1.1
2008	17	0.7*	0.4-1.1	3,397	1.1
2009	21	1.0	0.7-1.5	3,388	1.1
2010	25	1.1	0.7-1.6	3,404	1.0

Data Source: Vital Statistics, West Virginia Health Statistics Center
Age-adjusted to 2000 US Standard Million
a. Asthma Death: Death with a primary cause of asthma (ICD-10 codes J45-J46)
b. Age-adjusted rates per 100,000 population
c. See Appendix B for methodology used; 95% CI are not provided in National Vital Statistics Reports
*Use caution interpreting rates based on fewer than 20 deaths
2000 and 2010 estimates are Census 2000 and 2010 resident populations; 2001-2009 are vintage resident estimates.

Table 2. Age-Adjusted Asthma Death Rates by Gender, West Virginia 2000-2010						
Year	Males			Females		
	Deaths[a]	Rate[b]	95% CI[c]	Deaths	Rate	95% CI
2000	12	1.4*	0.7-2.4	24	2.2	1.4-3.3
2001	11	1.2*	0.6-2.1	17	1.4*	0.8-2.3
2002	5	0.5*	0.2-1.2	19	1.7*	1.0-2.7
2003	7	0.8*	0.3-1.6	24	2.2	1.4-3.3
2004	4	0.5*	0.1-1.3	9	0.7*	0.3-1.3
2005	3	0.3*	0.1-0.6	27	2.3	1.5-3.4
2006	6	0.7*	0.3-1.5	21	1.8	1.1-2.8
2007	14	1.5*	0.8-2.5	22	1.8	1.1-2.8
2008	4	0.5*	0.1-1.3	13	0.9*	0.5-1.5
2009	4	0.5*	0.1-1.3	17	1.5*	1.0-2.2
2010	7	0.7*	0.3-1.4	18	1.4*	0.8-2.2

Data Source: Vital Statistics, West Virginia Health Statistics Center
Age-adjusted to 2000 US Standard Million
a. Asthma Death: Death with a primary cause of asthma (ICD-10 codes J45-J46)
b. Age-adjusted rates per 100,000 population
c. See Appendix B for methodology used
*Use caution interpreting rates based on fewer than 20 deaths
2000 and 2010 estimates are Census 2000 and 2010 resident populations; 2001-2009 are vintage resident estimates.

Table. 3 Average Annual Asthma Death Rates by Age and Gender, West Virginia 2000-2010									
Age Group	Males			Females			Total		
	Deaths[a]	Rate[b]	95% CI[c]	Deaths	Rate	95% CI	Deaths	Rate	95% CI
<15	6	0.3*	0.1-0.7	3	0.2*	0.0-0.5	9	0.3*	0.1-0.5
15-44	13	3.3*	0.2-0.6	33	0.8	0.6-1.2	46	0.6	0.4-0.8
45-64	24	0.9	0.6-1.3	50	1.8	1.3-2.4	74	1.4	1.1-1.7
≥65	34	2.7	1.8-3.7	125	7.0	6.8-7.1	159	5.1	5.0-5.3
<65	43	0.5	0.4-0.7	86	1.0	0.8-1.3	129	0.8	0.6-0.9
≥65	34	2.7	1.8-3.7	125	7.0	6.6-7.3	159	5.1	5.0-5.3

Data Source: Vital Statistics, West Virginia Health Statistics Center
a. Asthma Death: Death with a primary cause of asthma (ICD-10 codes J45-J46)
b. Crude rates per 100,000 population
c. See Appendix B for methodology used
*Use caution interpreting rates based on fewer than 20 deaths

West Virginia
Asthma Burden Report
2007-2010

Issue 4: Asthma Risk Factors and Co-Morbidities

Bureau for Public Health
Health Statistics Center
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Earl Ray Tomblin, Governor
Karen L. Bowling, Cabinet Secretary

WEST VIRGINIA Department of Health & Human Resources

Preface

The West Virginia Asthma Education and Prevention Program (WV-AEPP) will publish issues of the *West Virginia Asthma Burden* as they are completed. This report is an update to *The Burden of Asthma in West Virginia* published in 2007 and is the most comprehensive source of information about asthma in the state. This report seeks to distribute information to WV-AEPP partners, health care providers, and public health professionals for the planning, development, and implementation of asthma-related activities.

Acknowledgements

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Asthma Risk Factors and Co-Morbidities

An asthma risk factor is any attribute, characteristic, or exposure that increases the likelihood[1] of an asthma episode or exacerbation. These include smoking, exposure to secondhand smoke, obesity, housing exposures, and air quality. Asthma risk factors can vary from person to person. They may lead to the onset of asthma or create issues with asthma control.

The majority of the risk factors described in this issue were obtained from the Behavioral Risk Factor Surveillance System (BRFSS) and the BRFSS Asthma Call-back Survey (BRFSS ACS). See Appendix A for additional information on data sources. Through the use of BRFSS, data on smoking, obesity, and some comorbid chronic conditions were gathered. Indoor asthma risk factors, actions taken to reduce these risk factors, as well as additional comorbid chronic conditions were measured via the BRFSS ACS. Smoking among public middle and high school students was measured in the Youth Tobacco Survey (YTS). Prior issues of the West Virginia Asthma Burden Report have identified adult females, individuals of low socioeconomic status (SES), seniors, and children as priority populations for interventions. This issue will describe risk and behavioral factors among these populations, as well as the overall population of people with asthma in West Virginia.

Definitions

The core module of the BRFSS administered to adults includes two questions about asthma:

(1) "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"
(2) "Do you still have asthma?"

The BRFSS uses the following questions answered by an adult proxy to define asthma for West Virginia children age 17 and younger:

(1) "Has a doctor, nurse, or other health professional ever said that the child has asthma?"
(2) "Does the child still have asthma?"

The second survey used to determine risk factors among West Virginia children age 17 and younger with asthma was the West Virginia Department of Education's YTS. The YTS is given directly to 6-12th graders enrolled in West Virginia public middle and high schools and asks:

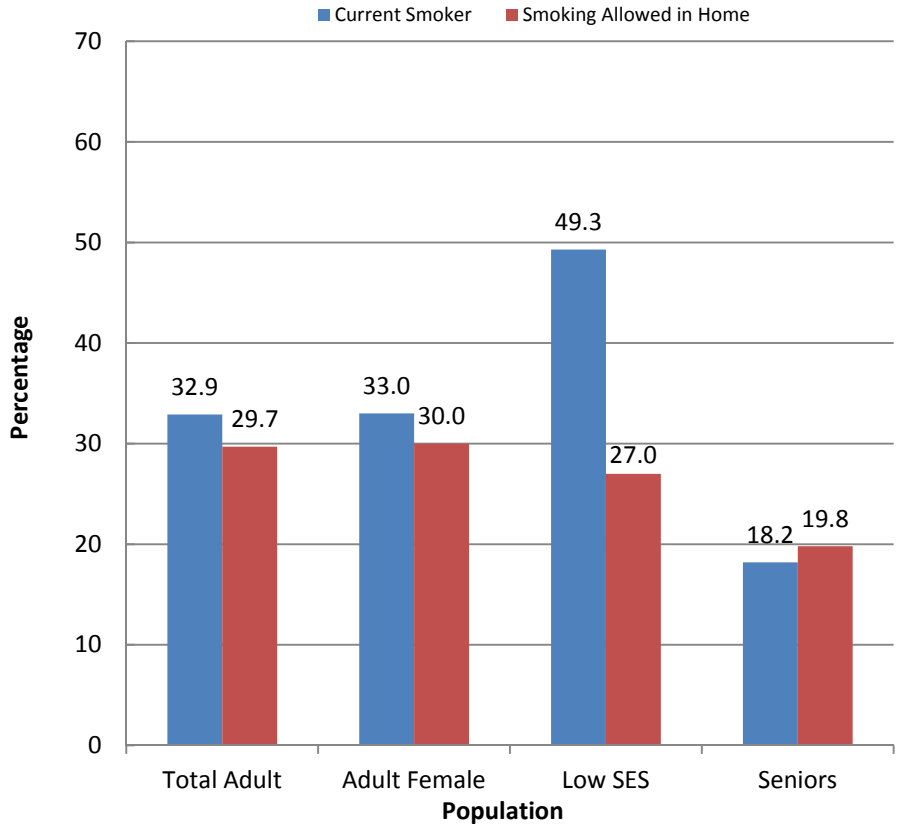
(1) "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"
(2) "Do you still have asthma?"

Individuals are categorized as having current asthma when there is a "yes" response to the first and second question on the survey.

Tobacco Exposures

Evidence suggests a causal relationship between secondhand smoke exposure and adult-onset asthma. Secondhand smoke is also implicated in worse asthma control[1]. Nearly one-third of West Virginia adults who currently have asthma reported they were also smokers in 2007-2010 (Figure 33). Smoking prevalence was significantly higher among those with current asthma (32.9%) than without (25.8%). This difference was statistically significant. Individuals of low SES reported a significantly higher prevalence of smoking than all other West Virginia adult priority populations. West Virginia seniors reported smoking and prevalence of smoking allowed in the home at the lowest percentages (18.2% and 19.8% respectively). The smoking rate among seniors was significantly lower than all other priority population groups. Nearly 37,300 (29.7%) West Virginia adults with current asthma reported that someone had smoked inside their home within the week prior to interview. Adult females reported this most often (30%), but no statistically significant differences were observed between populations.

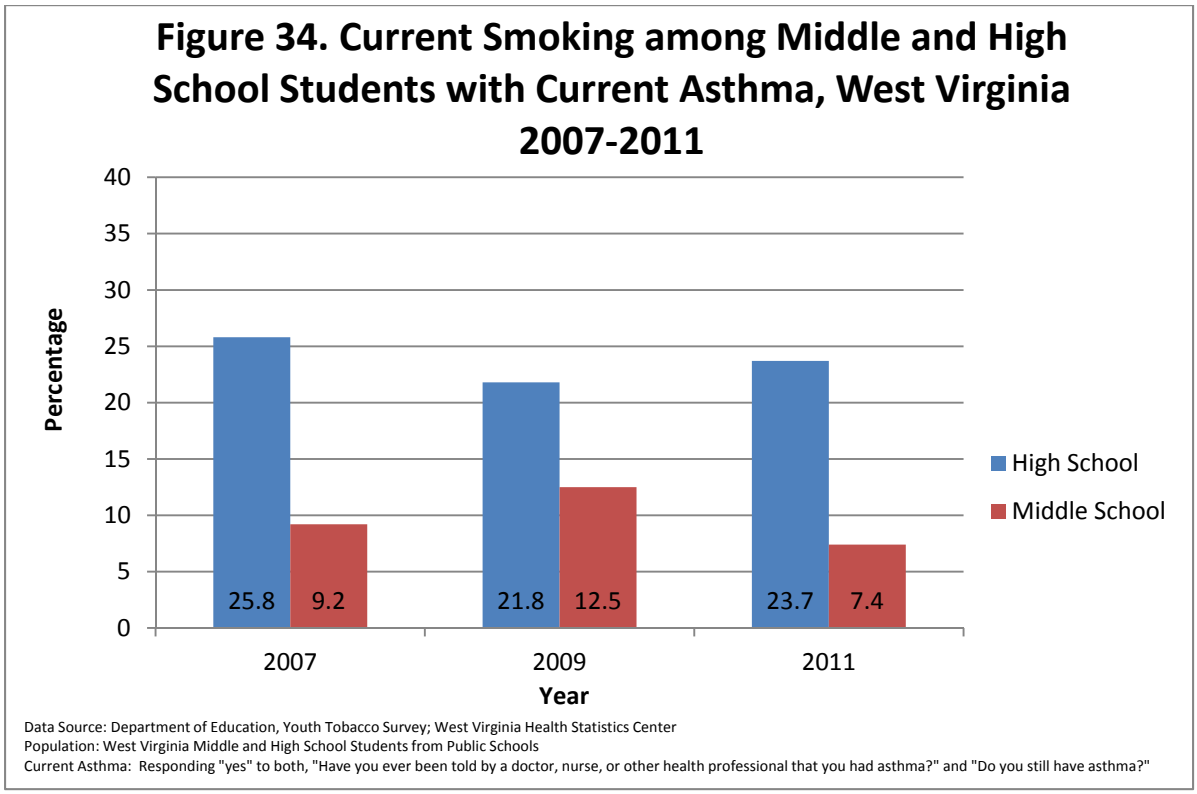
Figure 33. Smoking Exposures among Adults with Current Asthma in West Virginia, 2007-2010



Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
Current Asthma: Responding yes to both, "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Youth

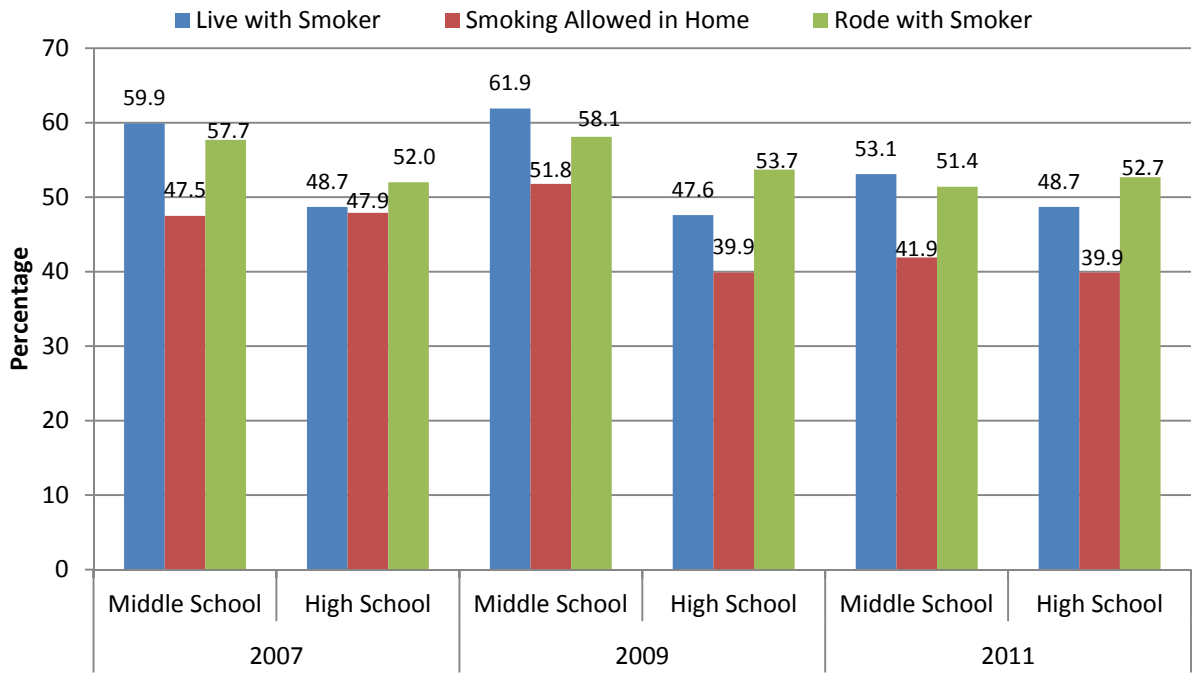
In 2007 and 2011, according to the YTS, West Virginia public high school students with current asthma reported a statistically significant higher rate of smoking than public middle school students with current asthma (Figure 34). Overall, smoking rates declined from 2007 to 2011 among both public middle and high school students with current asthma. Students in middle and high schools who did not have asthma reported current smoking at nearly equal rates as those with current asthma.



Data Source: Department of Education, Youth Tobacco Survey; West Virginia Health Statistics Center
Population: West Virginia Middle and High School Students from Public Schools
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Children who are exposed to secondhand smoke are at an increased risk for more severe asthma as smoking by parents causes respiratory symptoms and slows lung growth[1]. In 2007-2010, according to the BRFSS ACS, more than 6,900 (18.2%) West Virginia children with current asthma lived in a home where smoking was allowed. More than one-third of West Virginia public middle and high school students with current asthma reported they were exposed to secondhand smoke because it is allowed in their homes. Greater than 50% of public middle school students reported living with a smoker. More than half of middle and high school students with current asthma reported riding with a smoker within the past week (Figure 35).

Figure 35. Secondhand Smoke Exposures, Child Current Asthma, Middle and High School Students, West Virginia, 2007-2011

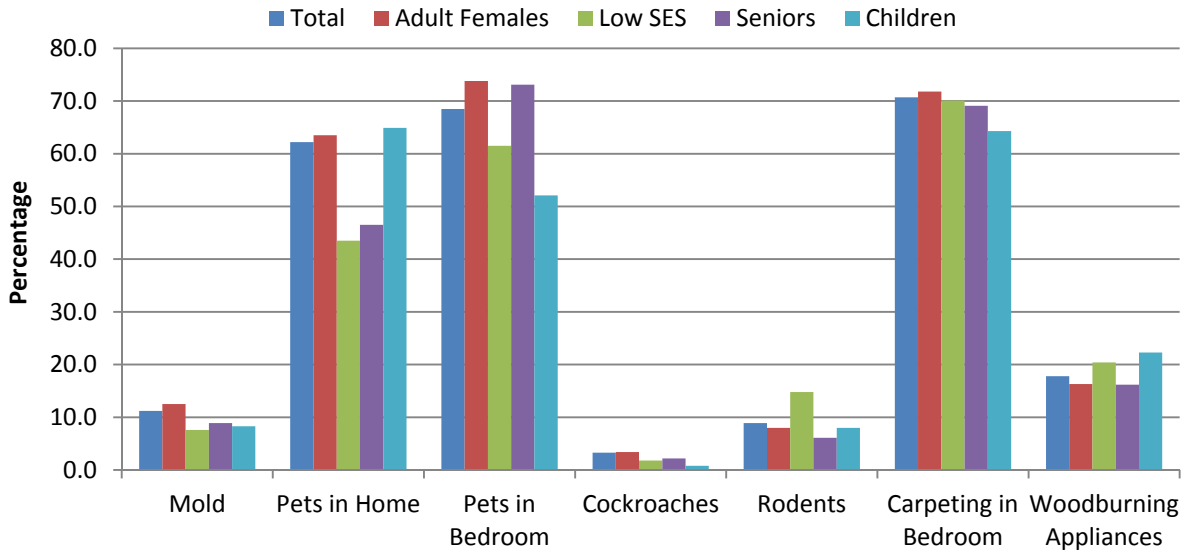


Data Source: Department of Education, Youth Tobacco Survey; West Virginia Health Statistics Center
Population: West Virginia Middle and High School Students from Public Schools
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Environmental Factors

In 2007-2010, 38% of West Virginians with current asthma were advised by a health professional to modify their environments to better control their asthma. Having pets inside the home, pets allowed in the bedroom (of those with pets), and carpeting in the bedroom were the most common household exposures among West Virginians with current asthma, while seeing a cockroach in the home was reported the least (Figure 36). Children were significantly more likely to report having pets in the home than seniors. However, seniors and adult females were found to be significantly more likely than children to report that pets were allowed in the bedroom. There were no other statistically significant differences observed.

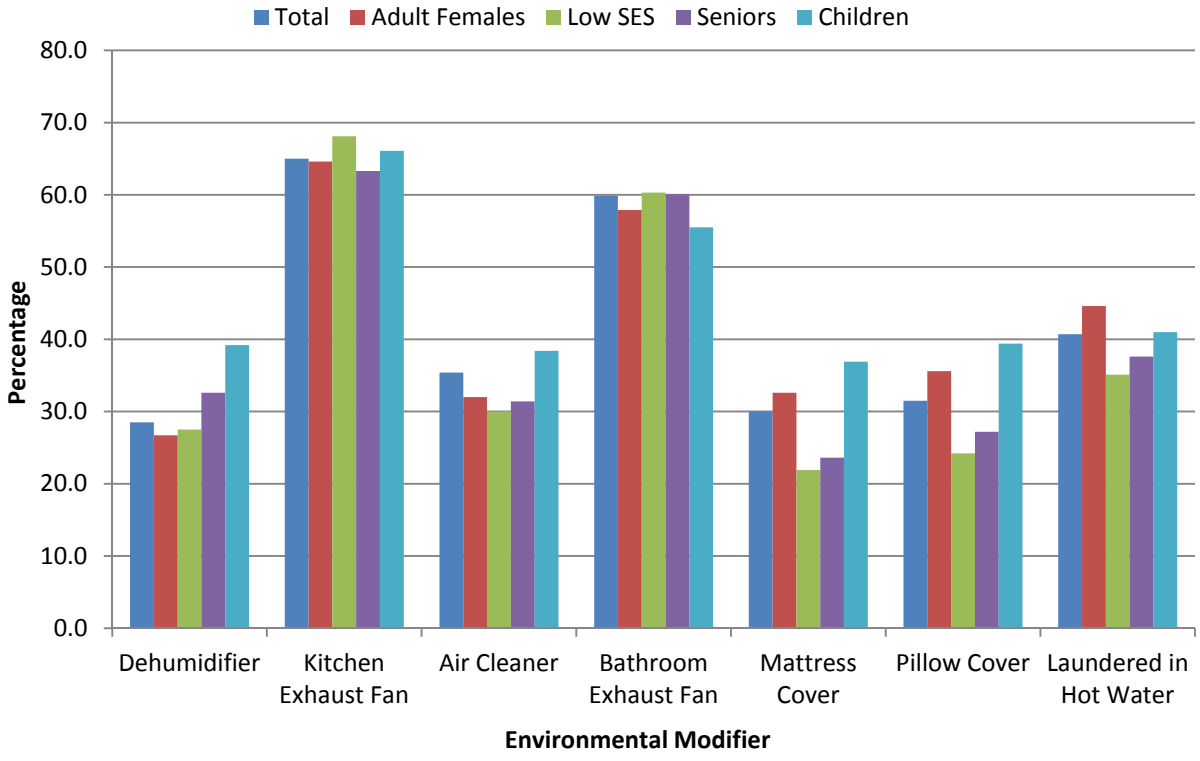
Figure 36. Household Environmental Exposures, West Virginians with Current Asthma, 2007-2010



Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
Current Asthma: Responding yes to both, ""Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Of the environmental modifications taken in the home to decrease exposure to indoor asthma triggers, the one reported the most often was the use of an exhaust fan in the kitchen and bathroom (Figure 37). The majority of West Virginians with current asthma did not use a dehumidifier, a mattress cover or a pillow cover to control dust mites in 2007-2010. No statistically significant observations between the priority populations were noted.

Figure 37. Actions Taken to Reduce Exposures in the Home, West Virginians with Current Asthma, 2007-2010

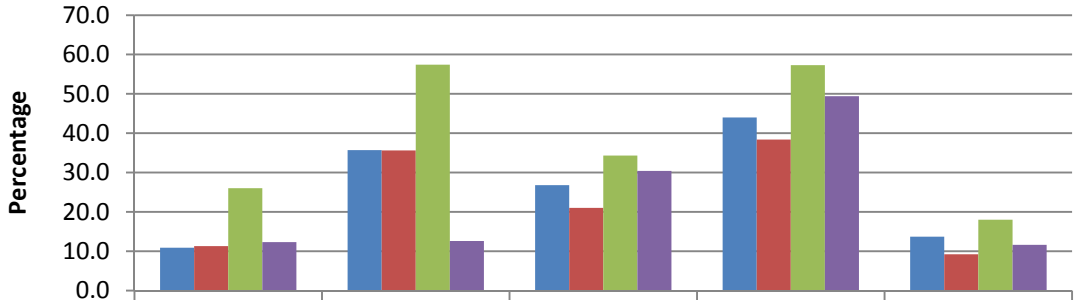


Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
Current Asthma: Responding yes to both, "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Work-Related Asthma (WRA)

WRA includes asthma worsened by factors related to the workplace environment as well as new onset of asthma attributed to the workplace environment[2]. More than 250 agents that are common to the workplace have the ability to cause or worsen WRA. These include chemicals, smoke, fumes and dust. In West Virginia, nearly 14,200 (29%) adults with current asthma reported they had quit or changed jobs because work conditions caused asthma or worsened symptoms in 2007-2010. Nearly 11% of West Virginia adults with current asthma reported their asthma was caused by their current job (Figure 38). Individuals of low SES with asthma were most affected by conditions in the workplace although many of these estimates were unreliable (see Appendix B for more information).

Figure 38. Work Related Asthma, West Virginia Adults with Current Asthma 2007-2010



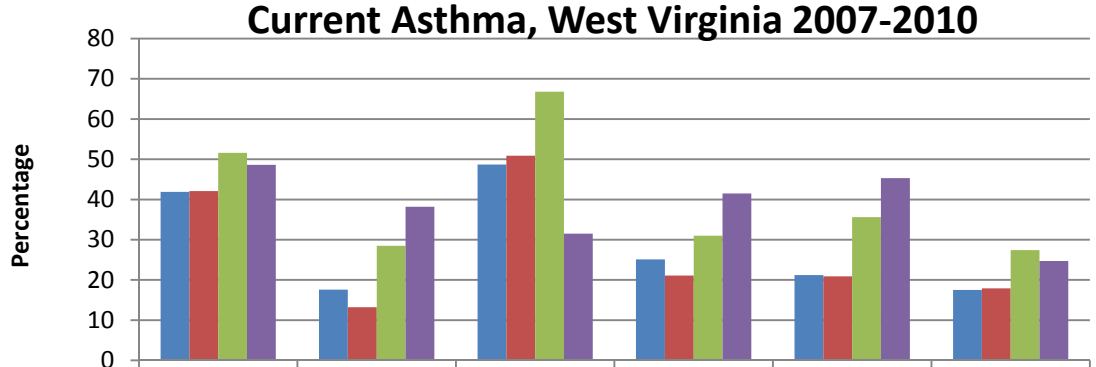
	Asthma caused by current job	Asthma worsened by current job	Asthma caused by previous job	Asthma worsened by previous job	Told by health professional asthma was work related
Total Adult	10.9	35.7	26.8	44.0	13.7
Adult Female	11.3	35.6	21.0	38.4	9.2
Low SES	26.0	57.4	34.3	57.3	18.0
Seniors	12.3	12.6	30.4	49.4	11.6

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
Current Asthma: Responding yes to both, "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Measures were for respondents with current asthma who had ever been employed outside of the home.

Comorbid Chronic Conditions

The Office of Community Health Systems and Health Promotion within the Bureau for Public Health of the West Virginia Department of Health and Human Resources positively impacts the quality of life of individuals with asthma, heart disease, and diabetes[3]. Chronic diseases and conditions have been described as the "public health challenge of the 21st century." Comorbidity in asthma is largely understudied, under-recognized, and has been associated with decreased quality of life, poor asthma control, and increased healthcare utilization[4]. Among West Virginia adults with asthma, depression was the comorbid chronic condition reported most frequently (48.7%), followed by bronchitis (41.9%), and with diabetes being reported least often at 17.5%. Seniors with asthma were more likely to report heart disease (stroke, heart attack, and angina/coronary heart disease), Chronic Obstructive Pulmonary Disease (COPD) and emphysema while persons of low SES were more likely to report bronchitis, diabetes, and depression (Figure 39).

Figure 39. Other Chronic Conditions among Adults with Current Asthma, West Virginia 2007-2010

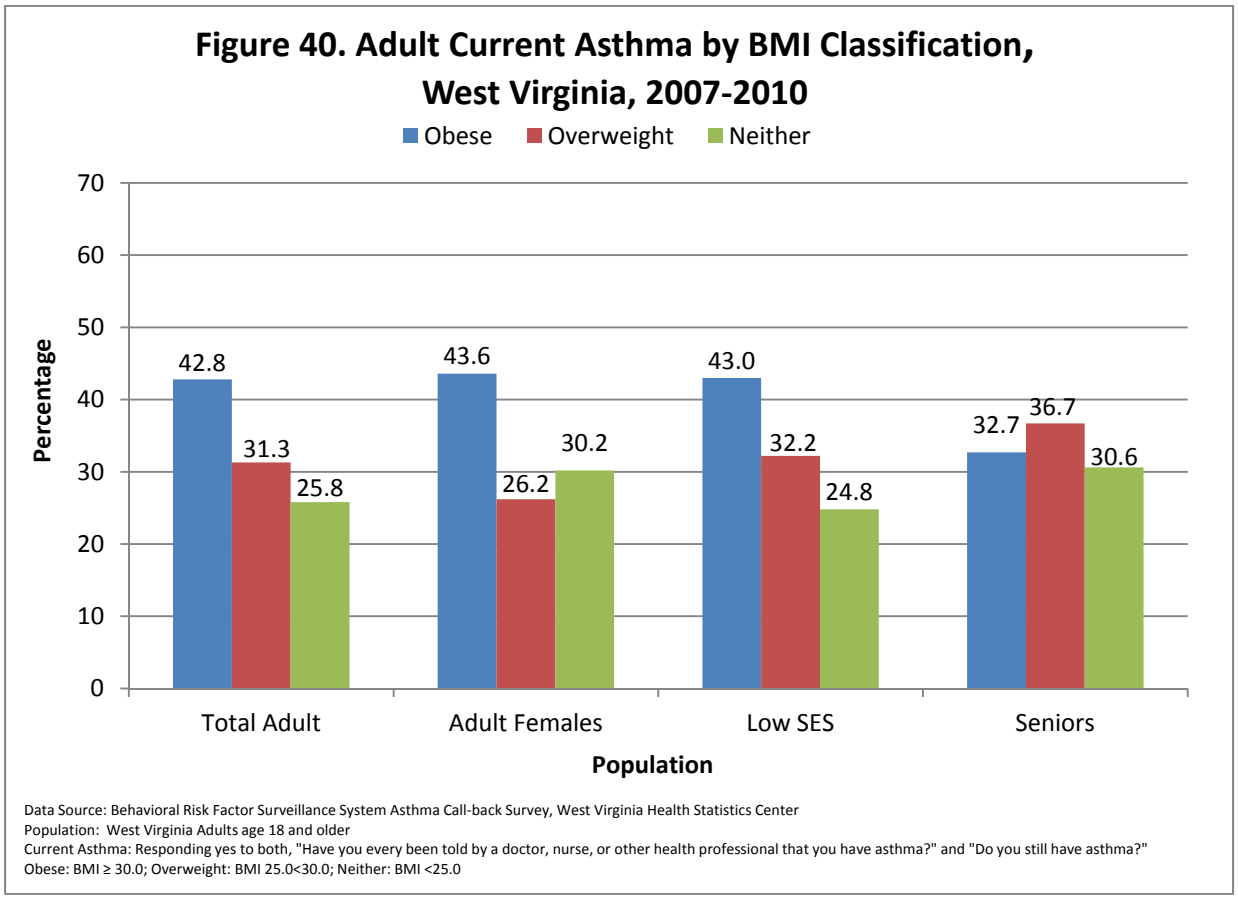


	Bronchitis	Emphysema	Depression	COPD	Heart Disease	Diabetes
Total Adult	41.9	17.6	48.7	25.1	21.2	17.5
Adult Female	42.1	13.2	50.9	21.1	20.9	17.9
Low SES	51.6	28.5	66.8	31.0	35.6	27.4
Seniors	48.6	38.2	31.5	41.5	45.3	24.7

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
Current Asthma: Responding yes to both, "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
Heart disease: Stroke, heart attack, angina/coronary heart disease

Obesity

Nationwide, obesity and asthma prevalence have both increased over the past decade[5]. It is unclear whether obesity is a cause or a result of asthma. Obesity is defined as a body mass index (BMI) of 30 kg/m^2 or greater, overweight is defined as a BMI of 25 to 29.9kg/m^2, and neither is defined as a BMI <25.0kg/m^2. BMI classification among seniors with current asthma was split fairly equally (Figure 40). The prevalence of obesity among West Virginia adults with current asthma was significantly higher than the prevalence of normal weight for all other priority populations.



Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
Current Asthma: Responding yes to both, "Have you every been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"
Obese: BMI ≥ 30.0; Overweight: BMI 25.0<30.0; Neither: BMI <25.0

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1. U.S. Department of Health & Human Services. (2006). *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General.* Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

2. Knoeller, G. (2012). *Work-Related Asthma-38 States and District of Columbia, 2006-2009.* Atlanta: Centers for Disease Control and Prevention.

3. Office of Community Health Systems and Health Promotion. (2011). *Advocating for Chronic Disease Management and Prevention 2011.* Charleston: West Virginia Department of Health and Human Resources.

4. Gershon, A., Wang, C., & To, T. (2010). Burden of comorbidity in individuals with asthma. *Thorax*, 612-618.

5. Strine, T. B. (2007). The Associations between Smoking, Physical Inactivity, Obesity and Asthma Severity in the General US Population. *J of Asthma*, 651-658.

Appendix A: Data Sources

Behavioral Risk Factor Surveillance System (BRFSS): The BRFSS survey is a state-based, ongoing, random-digit-dialed telephone survey of civilian, non-institutionalized adults ages 18 and older who live in the United States. Data on several topics are collected using the BRFSS, which allows for analysis of associations between various behaviors and asthma. The collection of these data has been occurring in a standard and reliable format for more than 25 years, allowing for analysis of time trends. Also, whereas a standard methodology is used in all states, state-to-state comparisons are allowed. More recently, the BRFSS has been expanded to include more cell phone surveys. BRFSS data must be interpreted with caution as data are self-reported. Additionally, individuals may have difficulty recalling past behaviors or may understate behaviors known to be unhealthy, socially unacceptable or illegal.

Since 2007, the BRFSS Asthma Call-back Survey (BRFSS ACS) was implemented in West Virginia as a follow-up to the BRFSS survey. Only one adult or child per household can participate in the ACS, which obtains in-depth information about asthma symptoms, episodes/attacks, self-management education, health care utilization and access, medication use, comorbidities, and environmental allergens and irritants. For additional information, visit: http://www.cdc.gov/brfss/. In order to maintain a level of consistency with data reporting throughout the *Asthma Burden*, of the data presented here begins in 2007.

Youth Tobacco Survey: The West Virginia Youth Tobacco Survey (YTS) collects information on tobacco use, attitudes and knowledge regarding tobacco, exposure to tobacco-related media, exposure to environmental tobacco smoke, and asthma among adolescents. The YTS was most recently administered in 2007, 2009, and 2011. Only 6-12th graders enrolled in West Virginia public schools are eligible to participate in this survey. These data are self-reported and should be interpreted with caution. Individuals may have difficulty recalling past behavior or may misstate behaviors due to the sensitivity of the questions. For additional information visit:
http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm

Appendix B: Methodology

Rate: Rates are calculated by dividing the number of events in a given time period by the number of people at risk of experiencing the event in that time period. Percentages are rates presented per 100 population.

95% Confidence Interval (95% CI): Confidence Intervals represent the range of values among which the true value would be found. This report presents the 95% CI, meaning that the true value would be within the given interval 95% of the time. Confidence intervals are mainly affected by the number of responses or events that the estimate is based on. If there are a small number of responses, the estimate will typically have a large confidence interval.

Statistically Significant: In this report, rates are said to be statistically significant when the 95% CI associated with each of the rates does not overlap. It can be stated with 95% certainty that the difference found between the two rates is not a random occurrence.

Based on CDC recommendations, estimates in this report were termed unreliable if any of the three following conditions were met:

(1) The estimate is based on responses from fewer than 50 respondents in the subsample or denominator of the prevalence estimate calculation.
(2) The 95% CI of the estimate has a width or range greater than 20 (e.g., 95% CI = 10.0-30.5).
(3) The estimate has a relative standard error (RSE) of 30.0% or higher. The RSE is obtained by dividing the standard error of the estimate by the estimate itself. It is calculated by the SAS® software, a commonly used statistical software package.

Appendix C: Detailed Tables

Table 1. Smoking Exposures Among Adults with Current Asthma[a] by Priority Population, West Virginia, 2007-2010, BRFSS and BRFSS ACS				
	Current Smoker		Smoking Allowed in Home	
	Number[b]	% (95% CI)	Number	% (95% CI)
Total Adult	40,800	32.9 (29.8-36.0)	37,300	29.7 (25.5-34.0)
Adult Female	27,000	33.0 (29.4-36.6)	24,500	30.0 (25.1-35.0)
Adult Male	13,800	32.6 (26.9-38.3)	12,800	29.2 (21.3-37.1)
Low SES[c]	8,600	49.3 (41.6-56.9)	6,300	36.5 (27.2-45.8)
Higher SES[c]	27,500	27.7 (24.4-31.0)	27,700	27.0 (22.4-31.7)
Seniors	4,300	18.2 (14.3-22.2)	4,800	19.8 (14.5-25.2)

Data Source: Behavioral Risk Factor Surveillance System, Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Low SES: Income ≤$25,000 and education < high school diploma; High SES: income >$25,000 and education ≥ high school diploma

Table 2. Smoking Exposures Among Public Middle and High School Students with Current Asthma[a], West Virginia 2007-2011, Youth Tobacco Survey												
	2007				2009				2011			
	Middle School		High School		Middle School		High School		Middle School		High School	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Current Smoker	700	9.2 (2.2-16.1)	2,600	25.8 (18.1-33.4)	1,000	12.5 (8.3-16.8)	2,100	21.8 (14.9-28.7)	700	7.4 (4.9-9.9)	2,400	23.7 (14.9-32.5)
Live with Smoker	4,300	59.9 (51.7-68.2)	5,400	55.9 (47.1-64.8)	5,200	61.9 (55.4-68.3)	4,700	47.6 (39.2-56.0)	5,300	53.1 (46.9-59.4)	5,100	48.7 (38.8-58.7)
Smoking Allowed in Home	3,400	47.5 (41.8-53.2)	4,800	47.9 (39.4-56.4)	4,000	48.2 (40.1-56.3)	3,900	39.9 (32.5-47.3)	4,100	41.9 (35.4-48.4)	4,100	39.9 (28.8-50.9)*
Rode with Smoker	4,200	57.7 (47.7-67.6)	5,200	52.0 (43.2-60.7)	4,900	58.1 (48.7-67.5)	5,300	53.7 (48.3-59.1)	5,100	51.4 (44.7-58.1)	5,500	52.7 (40.0-65.3)

Data Source: West Virginia Department of Education; Youth Tobacco Survey; West Virginia Health Statistics Center
Population: West Virginia Public School Students, grades 6-12
a. Current Asthma: Responding "yes" to both "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"
b. Estimated number of students with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
***** Use caution interpreting this estimate. It does not meet one or more reliability criteria.

Table 3. Household Environmental Exposures and Actions to Reduce Exposures, West Virginians with Current Asthma[a], 2007-2010, BRFSS ACS					
	Total Population	Adult Female	Low SES[b]	Seniors	Children
	Number[c] % (95% CI)	Number % (95% CI)	Number % (95% CI)	Number % (95% CI)	Number % (95% CI)
Used Gas to Cook	53,300 32.7 (29.1-36.3)	25,700 31.5 (26.9-36.1)	4,700 27.8 (18.8-36.8)	7,400 30.7 (24.6-36.9)	11,800 31.0 (23.8-38.2)
Saw Mold	18,400 11.3 (8.9-13.6)	10,200 12.5 (9.1-16.0)	1,300 7.6 (2.4-12.9)	2,100 8.9 (5.3-12.4)	3,100 8.3 (3.7-12.8)
Indoor Furry/Feathered Pets	101,700 62.2 (58.6-65.9)	51,800 63.5 (58.7-68.3)	7,500 43.5 (33.4-53.6)*	11,200 46.5 (39.9-53.2)	24,700 64.9 (57.2-72.6)
Pets Allowed in Bedroom	68,800 68.2 (63.4-73.0)	38,100 73.8 (67.7-80.0)	4,600 61.5 (47.5-75.4)*	8,100 73.1 (64.2-82.0)	12,900 52.1 (42.1-62.2)
Saw Cockroach(es)	5,400 3.3 (1.8-4.7)	2,800 3.4 (1.7-5.2)	300 1.8 (0.0-3.9)	500 2.2 (0.5-3.9)	300 0.8 (0.0-2.4)
Saw Rodent(s)	14,600 8.9 (6.8-11.1)	6,500 8.0 (5.3-10.7)	2,500 14.8 (5.6-23.9)	1,500 6.1 (3.2-8.9)	3,000 8.0 (3.6-12.3)
Carpeting in Bedroom	115,300 70.7 (67.2-74.2)	58,500 71.8 (67.2-76.4)	12,000 70.1 (59.9-80.3)*	16,600 69.1 (63.0-75.2)	24,400 64.3 (56.2-72.3)
Unvented Gas Appliances	16,000 9.8 (7.7-12.0)	6,500 8.1 (6.0-10.1)	1,900 11.3 (5.1-17.5)	3,100 12.7 (8.3-17.2)	3,300 8.8 (4.9-12.6)
Woodburning Appliances	29,000 17.8 (14.7-20.8)	13,300 16.3 (12.4-20.2)	3,500 20.4 (12.4-28.5)	3,900 16.2 (11.1-21.2)	8,400 22.3 (14.8-29.9)
Dehumidifier	46,400 28.5 (25.0-32.0)	21,700 26.7 (22.0-31.3)	4,700 27.5 (18.9-36.2)	7,700 32.6 (26.3-38.9)	14,900 39.2 (31.2-47.3)
Kitchen Fan	105,800 65.0 (61.3-68.7)	52,700 64.6 (59.5-69.8)	11,400 68.1 (58.5-77.8)	15,200 63.3 (57.0-69.6)	25,000 66.1 (58.3-73.9)
Bathroom Fan	97,400 59.9 (56.1-63.8)	47,000 57.9 (52.7-63.2)	10,300 60.3 (50.7-69.9)	14,400 60.1 (53.7-66.4)	20,900 55.5 (47.3-63.6)
Air Cleaner	57,500 35.4 (31.5-39.2)	26,000 32.0 (27.1-37.0)	5,100 30.0 (19.6-40.5)*	7,500 31.4 (25.2-37.7)	14,500 38.4 (30.4-46.4)
Mattress Cover	48,300 30.0 (26.5-33.5)	26,400 32.6 (27.7-37.5)	3,600 21.9 (13.3-30.5)	5,500 23.6 (17.9-29.4)	14,000 36.9 (29.2-44.6)
Pillow Cover	50,800 31.5 (27.9-35.1)	28,900 35.6 (30.6-40.6)	4,000 24.2 (14.9-33.5)	6,400 27.2 (21.4-32.9)	15,000 39.4 (31.6-47.2)
Laundered in Hot Water	64,600 40.7 (36.8-44.6)	36,400 44.6 (39.4-49.8)	5,700 35.1 (24.9-45.3)*	8,900 37.6 (31.1-44.1)	15,600 41.0 (33.1-48.8)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Low SES: Income ≤$25,000 and education < high school diploma; High SES: income >$25,000 and education ≥ high school diploma
c. Estimated number of residents with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
* Use caution interpreting this estimate. It does not meet one or more reliability criteria.

Table 4. Work-Related Asthma (WRA), West Virginia Adults with Current Asthma[a], 2007-2010, BRFSS ACS						
	Total Adults	Adult Females	Adult Males	Low SES[b]	High SES[b]	Seniors
	Number[c] % (95%CI)	Number % (95%CI)	Number % (95%CI)	Number % (95%CI)	Number % (95%CI)	Number % (95%CI)
Caused by Current Job	4,800 10.9 (6.9-14.8)	3,200 11.3 (6.6-16.0)	1,600 10.0 (3.1-16.9)	300 26.0 (0.0-53.2)*	4,500 10.4 (6.5-14.3)	40[¥] 2.1 (0.0-6.4)
Worsened by Current Job	16,600 35.7 (28.7-42.8)	10,600 35.6 (27.4-43.9)	5,900 35.9 (22.8-48.9)	1,000 57.4 (27.3-87.5)*	15,500 34.8 (27.6-42.0)	300 12.6 (0.0-25.5)*
Caused by Previous Job	26,500 26.8 (22.6-31.1)	13,600 21.0 (16.3-25.6)	12,900 37.9 (29.4-46.5)	4,000 34.3 (23.3-45.3)*	21,300 25.1 (20.5-29.7)	5,300 30.4 (23.0-37.8)
Worsened by Previous Job	45,300 44.0 (39.2-48.8)	25,800 38.4 (32.9-44.0)	19,500 54.6 (45.6-63.5)	6,900 57.3 (45.3-69.3)*	36,800 41.8 (36.5-47.1)	9,300 49.4 (41.9-56.9)
Told by Health Professional that Asthma was WRA	15,300 13.7 (10.6-16.7)	6,600 9.2 (6.5-12.0)	8,700 21.7 (15.0-28.4)	2,400 18.0 (9.3-26.6)	12,00 12.5 (9.3-15.7)	2,400 11.6 (7.3-15.9)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Low SES: Income ≤$25,000 and education < high school diploma; High SES: Income >$25,000 and education ≥ high school diploma
c. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
* Use caution interpreting this estimate. It does not meet one or more reliability criteria.
¥ This number is the weighted frequency calculated by SAS software, rounded to the nearest tenth due to a low number of seniors reporting this measure.

Table 5. Comorbid Chronic Conditions, West Virginia Adults with Current Asthma[a], 2007-2010, BRFSS and BRFSS ACS						
	Total Adults	Adult Females	Adult Males	Low SES[b]	High SES[b]	Seniors
	Number[c] % (95%CI)	Number % (95%CI)	Number % (95%CI)	Number % (95%CI)	Number % (95%CI)	Number % (95%CI)
Bronchitis	51,700 41.9 (37.5-46.3)	33,900 42.1 (37.0-47.1)	17,800 41.6 (33.2-49.9)	8,600 51.6 (41.2-62.0)	39,500 38.9 (34.1-43.7)	11,400 48.6 (41.8-55.3)
Emphysema	21,800 17.6 (14.7-20.6)	10,700 13.2 (10.7-15.8)	11,100 26.0 (19.1-32.8)	4,800 28.5 (19.6-37.5)	15,800 15.5 (12.4-18.7)	8,900 38.2 (31.6-44.7)
Depression	60,700 48.7 (44.3-53.2)	41,400 50.9 (45.6-56.1)	19,300 44.7 (36.3-53.0)	11,100 66.8 (58.0-75.7)	47,600 46.5 (41.5-51.4)	7,500 31.5 (25.5-37.4)
COPD	31,000 25,1 21.5-28.7	17,000 21.1 (17.8-24.4)	14,000 32.8 (24.9-40.7)	5,200 31.0 (22.5-39.5)	24,700 24.4 (20.4-28.5)	9,700 41.5 (34.9-48.2)
Heart Disease	25,900 21.1 (19.0-23.3)	16,900 20.9 (18.4-23.4)	9,000 21.6 (17.6-25.6)	11,100 35.6 (28.6-42.5)	18,200 18.5 (16.2-20.7)	12,500 45.2 (40.2-50.3)
Diabetes	22,200 17.5 (15.4-19.7)	14,700 17.9 (15.4-20.5)	7,000 16.7 (12.9-20.5)	4,800 27.4 (21.2-33.6)	15,500 15.6 (13.3-18.0)	5,800 24.7 (20.6-28.9)
Obesity	50,600 42.8 (39.7-46.0)	33,400 43.6 (39.9-47.4)	17,200 41.4 (35.7-47.1)	7,300 43.0 (35.3-50.7)	40,500 42.8 (39.3-46.3)	7,500 32.7 (27.9-37.5)
Overweight	37,000 31.3 (28.3-34.4)	20,000 26.2 (22.8-29.5)	17,000 40.8 (35.0-46.6)	5,500 32.2 (24.4-39.9)	29,400 31.0 (27.6-34.4)	8,400 36.7 (31.8-41.6)
None	30,500 25.8 (22.9-28.7)	23,100 30.2 (26.5-33.9)	7,400 17.8 (13.5-22.1)	4,200 24.8 (18.9-30.7)	24,700 26.2 (22.8-29.5)	7,000 30.6 (25.9-35.3)

Data Source: Behavioral Risk Factor Surveillance System, Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Adults age 18 and older
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Low SES: Income ≤$25,000 and education < high school diploma; High SES: Income >$25,000 and education ≥ high school diploma
c. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

West Virginia
Asthma Burden Report
2007-2010

Issue 5: Asthma Management and Control

Bureau for Public Health
Health Statistics Center
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Earl Ray Tomblin, Governor
Karen L. Bowling, Cabinet Secretary

WEST VIRGINIA Department of Health & Human Resources

Preface

The West Virginia Asthma Education and Prevention Program (WV-AEPP) will publish issues of the *West Virginia Asthma Burden* as they are completed. This report is an update to *The Burden of Asthma in West Virginia* published in 2007 and is the most comprehensive source of information about asthma in the state. This report seeks to distribute information to WV-AEPP partners, health care providers, and public health professionals for the planning, development, and implementation of asthma-related activities.

Acknowledgements

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West Virginia Department of Health and Human Resources

West Virginia asthma
Education and Prevention Program
West Virginia Department of Health and Human Resources

Asthma Management and Control

Asthma symptoms vary from person to person and can change throughout one's lifetime. Symptoms of an asthma attack can include coughing, difficulty breathing, wheezing and tightness/pain in the chest. Sometimes asthma symptoms may be so severe that medication or other treatment is required to restore normal breathing. Asthma severity is determined by its impact on day-to-day activities and risk of future aggravation. Through proper medication use and self-management, asthma symptoms can be controlled allowing individuals with asthma to lead healthy and active lives. Poor asthma management can result in frequent symptoms, activity limitations, and decreased quality of life.

In this issue, data on asthma management and control was obtained from the Behavioral Risk Factor Surveillance System Asthma Call-back Survey (BRFSS ACS). See Appendix A for additional information on data sources. Asthma severity classification was estimated based on responses to asthma symptom and disease management questions. Additional information about asthma management for 6-12th graders enrolled in West Virginia public middle and high schools was gathered from the Youth Tobacco Survey (YTS), which is administered by the West Virginia Department of Education. Prior issues of the West Virginia Asthma Burden identified adult females, individuals of low socioeconomic status (SES), seniors, and children as priority populations for interventions. However, due to the complex nature of analyses in this issue, priority populations were isolated in few measures.

Definitions

The core module of the BRFSS administered among adults includes two questions about asthma:

(1) "Have you ever been told by a doctor, nurse or other health professional that you had asthma?"
(2) "Do you still have asthma?"

The BRFSS uses the following questions answered by an adult proxy to define asthma for West Virginia children age 17 and younger:

(1) "Has a doctor, nurse, or other health professional ever said that the child has asthma?"
(2) "Does the child still have asthma?"

The YTS is given directly to West Virginia children age 17 and younger and asks:

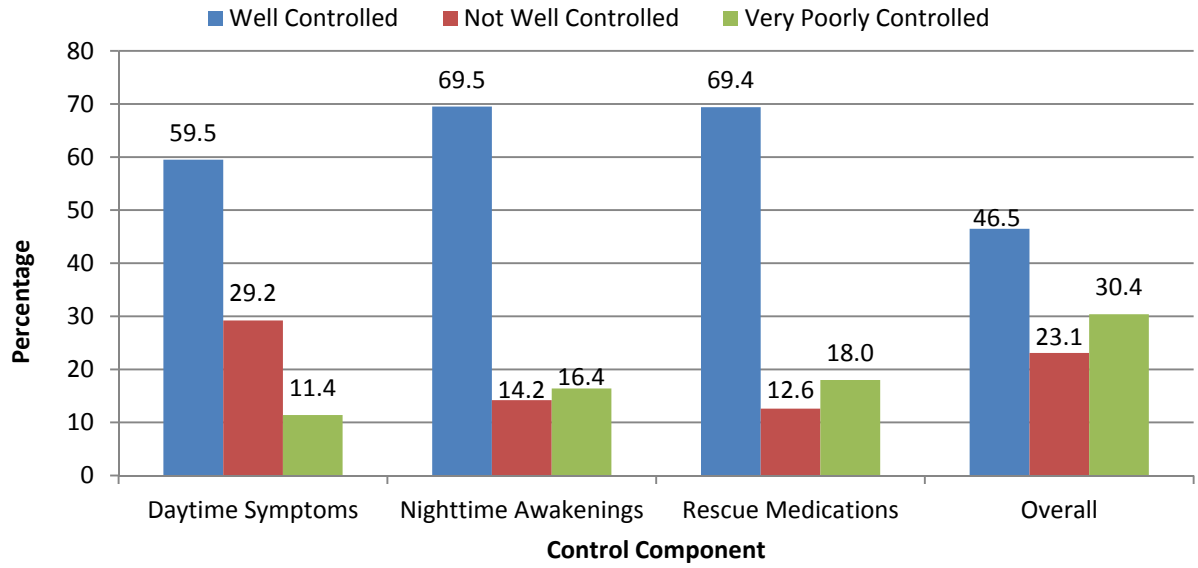
(1) "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?"
(2) "Do you still have asthma?"

Individuals are categorized as having current asthma when there is a "yes" response to the first and second question on either survey.

Asthma Control

Daytime symptoms, nighttime awakenings, and use of rescue medications are measures of asthma control. Overall, almost half (46.5%) of West Virginians with current asthma met criteria for well controlled asthma (Figure 41). Analysis of individual asthma control components also indicated that a greater percentage of West Virginians with current asthma had well controlled asthma in 2007-2010 as compared to not well controlled and very poorly controlled. Nearly 44% of West Virginia adults and 55.4% of children with current asthma met criteria for well controlled asthma, while 33.2% of adults and 21.1% of children had very poorly controlled asthma (data not shown, see Appendix C).

Figure 41. Asthma Control Level within Individual Control Components, Current Asthma, West Virginia 2007-2010



Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

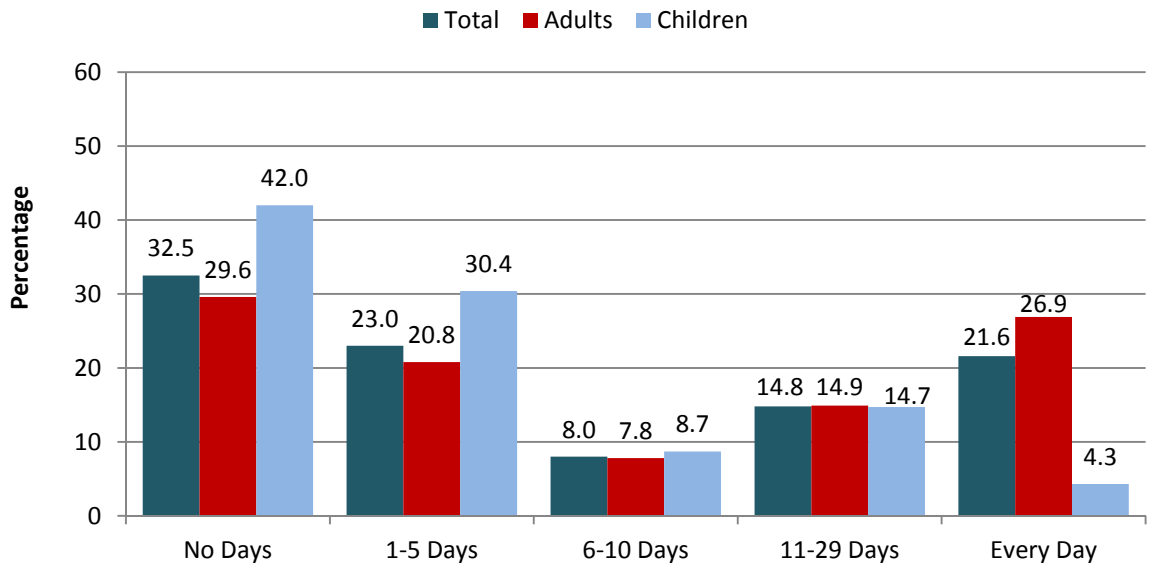
Levels of asthma control were determined by the National Asthma Education and Prevention Program (NAEPP) of the National Heart, Lung, and Blood Institute (NHLBI).

- Well controlled: Asthma symptoms ≤8 days in past 30 days, nighttime awakenings ≤2 times in past 30 days, and rescue medication used ≤0.29 times per day.
- Not well controlled: Asthma symptoms >8 days in past 30 days, nighttime awakenings 3-12 times in the past 30 days, or rescue medication used >0.29 to <2.00 times per day.
- Very poorly controlled: Asthma symptoms every day in the past 30 days and throughout the day, nighttime awakenings ≥13 times in the past 30 days, or rescue medication used ≥2.00 times per day.

Daytime Symptoms

Nearly one-third (32.5%) of West Virginians with current asthma reported having no asthma symptoms during the past 30 days (Figure 42). Among children with current asthma who experienced asthma symptoms, most occurred 1-5 days in the past month (30.4%), and only 4.3% experienced daily symptoms. More than a quarter (26.9%) of adults with current asthma reported daily symptoms, when compared to children. This observation was statistically significant (see Appendix B for methodology). Adults were less likely to report no days of symptoms than children (29.6% and 42.0% respectively).

Figure 42. Number of Days with Asthma Symptoms in Past Month, Current Asthma, West Virginia, 2007-2010

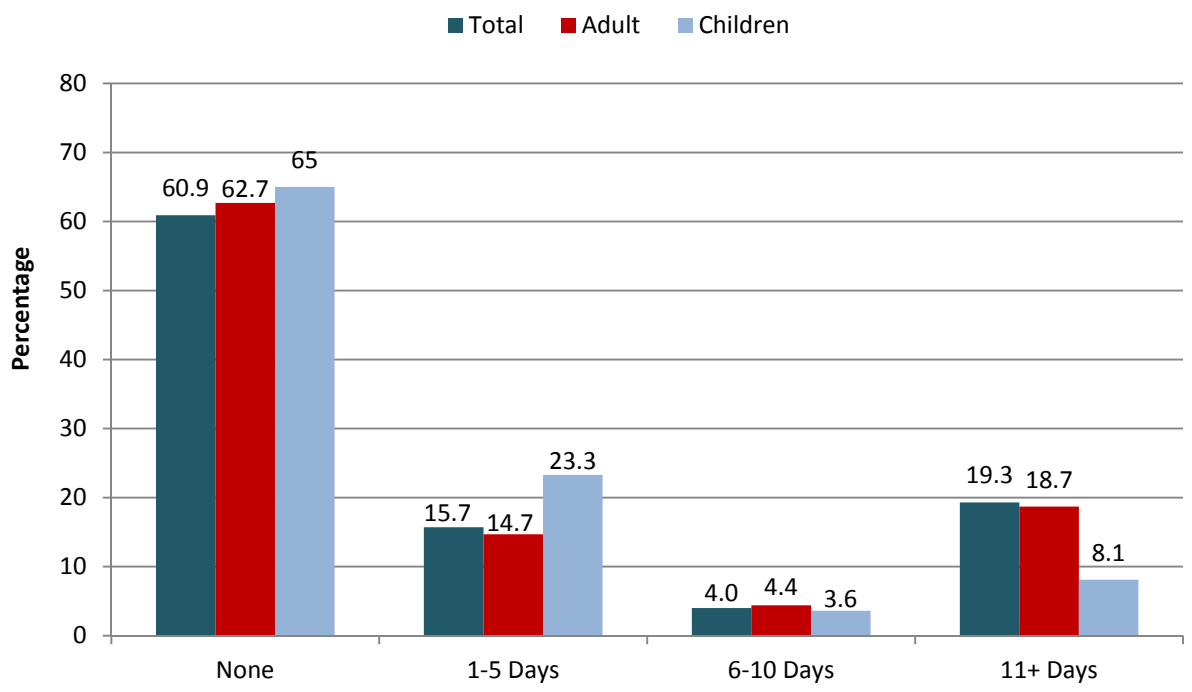


Data Source: Behavioral Risk Factor Surveillance System Asthma Callback Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Nighttime Awakenings

More than 60% of West Virginians with current asthma reported having no nighttime awakenings due to asthma in the past 30 days (Figure 43). Sleep disruptions among children with current asthma occurred most often 1-5 days in the past month. Of adults with current asthma, nighttime awakenings were reported most often 11 or more times in the past month (18.7%). This was statistically significantly more than children who reported 11 or more days of sleep disruption (8.1%).

Figure 43. Nighttime Awakenings in the Past 30 Days, Current Asthma, West Virginia 2007-2010

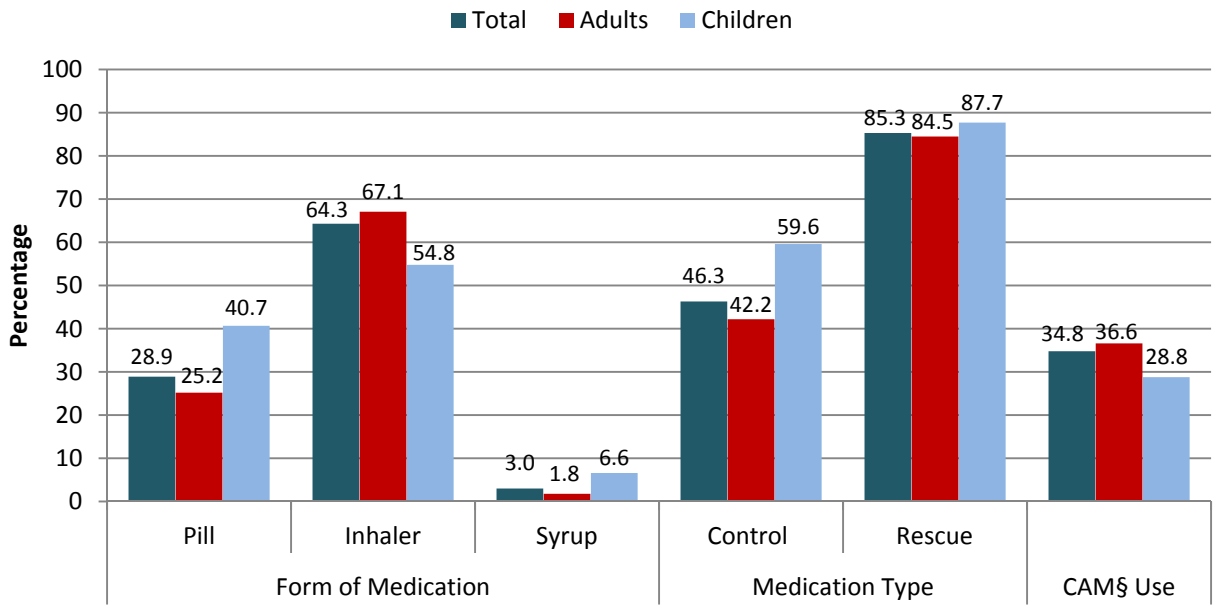


Data Source: Behavioral Risk Factor Surveillance System Asthma Callback Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Asthma Medication Use

Medication use was characterized by form, type, and any use of Complementary and Alternative Medicine (CAM) therapy (Figure 44). Although an inhaler was the most common form of medication used (64.3%), more than a third (34.8%) of West Virginians with current asthma reported the use of CAM. Rescue medication was used statistically significantly more than control medication (85.3% compared to 46.3%). Breathing technique was the CAM most commonly reported (25.1%). (See Appendix C for a complete listing of CAM therapies measured).

Figure 44. Medication Use in Past 3 Months, Current Asthma, West Virginia 2007-2010

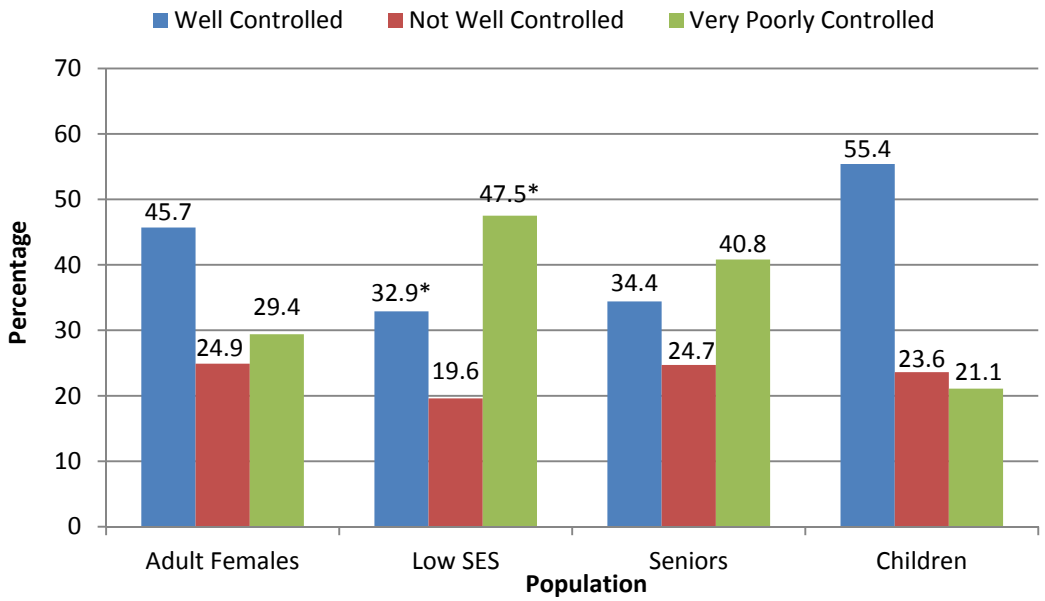


Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both ,"Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"
§ Complementary and Alternative Medicine

Asthma Control among Priority Populations

Adult females as well as children in West Virginia with current asthma had higher prevalence of well controlled asthma than other priority populations (45.7% and 55.4% respectively). More than 40% of seniors and individuals of low SES had very poorly controlled asthma in 2007-2010 (Figure 45). Seniors were statistically significantly more likely to report very poorly controlled asthma than adult females and children. There were no statistically significant differences in reference to the not well controlled category of asthma control.

Figure 45. Asthma Control Prevalence by Priority Population, Current Asthma, West Virginia, 2007-2010



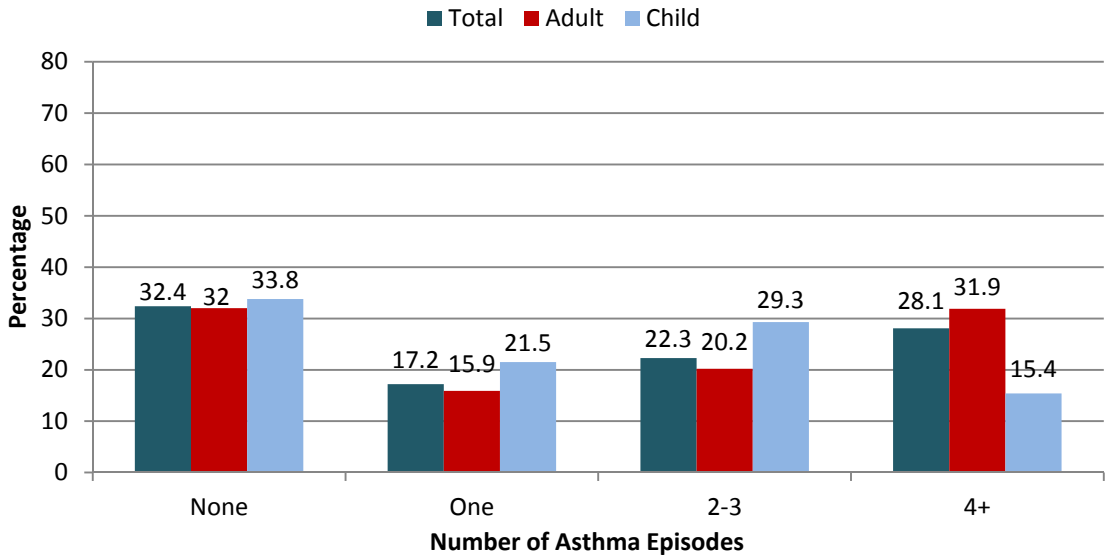
Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"
Low SES: Income ≤$25,000 and education < high school diploma; High SES: Income >$25,000 and education ≥ high school diploma

Asthma Management

Asthma Episodes – BRFSS ACS

Nearly one-third (32.4%) of West Virginia residents with current asthma reported having no asthma episodes within the three months prior to the survey (Figure 46). Among adults who reported having an asthma episode, about one out of three (31.9%) reported having at least four. Children were more likely to report having no asthma episodes and least likely to report having four or more (15.4%).

Figure 46. Frequency of Asthma Episodes in the Past Three Months, Current Asthma, West Virginia 2007-2010

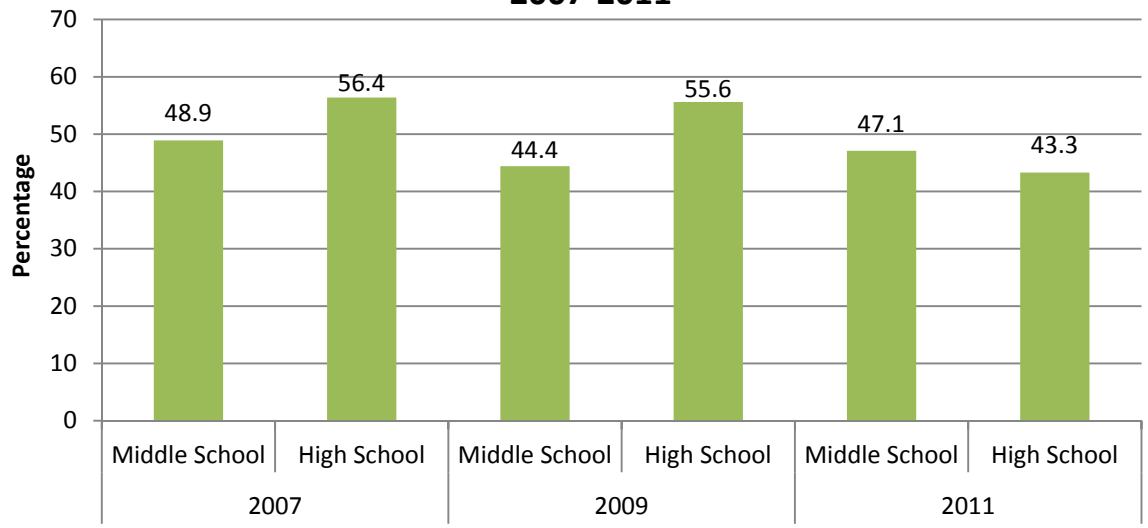


Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both ,"Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Asthma Episodes – Youth Tobacco Survey (YTS)

According to the YTS, public high school students experienced asthma episodes more than public middle school students in every year except 2011 (Figure 47). Overall, there was a decline reported in experiencing at least one asthma episode among middle and high school students from 2007 to 2011. Neither of these decreases was statistically significant.

Figure 47. Experienced Asthma Episodes among Middle and High School Students with Current Asthma, West Virginia 2007-2011

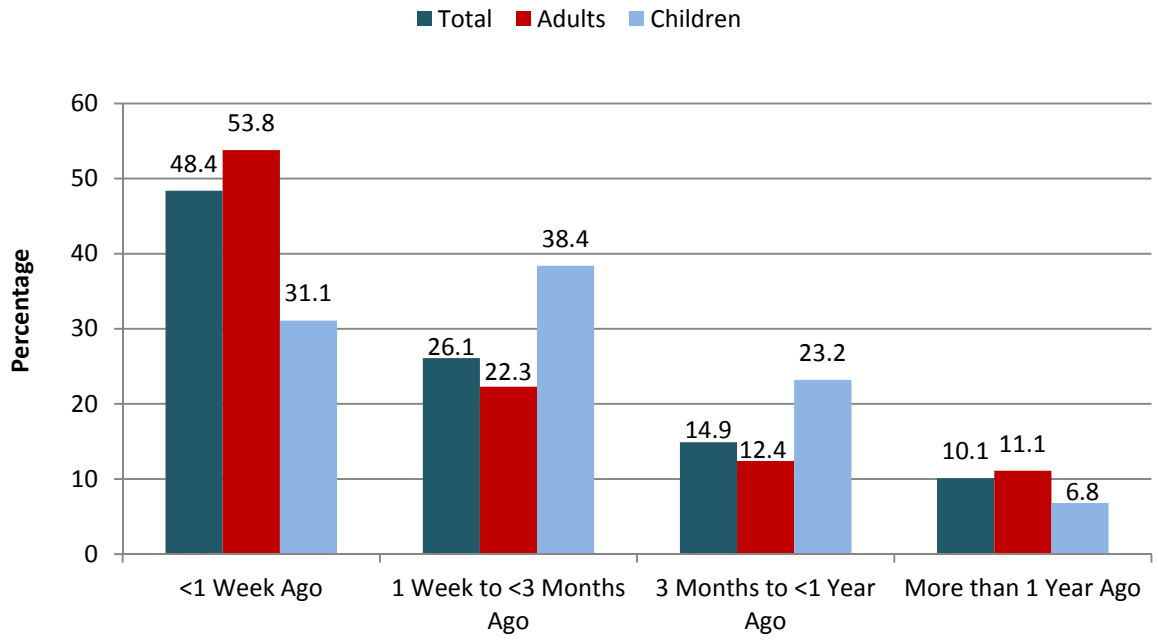


Data Source: West Virginia Department of Education, Youth Tobacco Survey; West Virginia Health Statistics Center
Population: West Virginia Middle and High School Students from Public Schools
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Most Recent Asthma Symptoms

Nearly half (48.5%) of West Virginians with current asthma reported they had experienced asthma symptoms less than a week ago (Figure 48). Children with current asthma experienced asthma symptoms less frequently than adults, with most occurring one week to less than three months prior to the survey (38.4%). More than half (53.8%) of adults and 31.3% of children with current asthma reported experiencing symptoms within the week prior to the survey. These differences were statistically significant. About 11% of adults and nearly 7% of children with current asthma reported being symptom-free within the past year.

Figure 48. Most Recent Asthma Symptoms, Current Asthma, West Virginia, 2007-2010

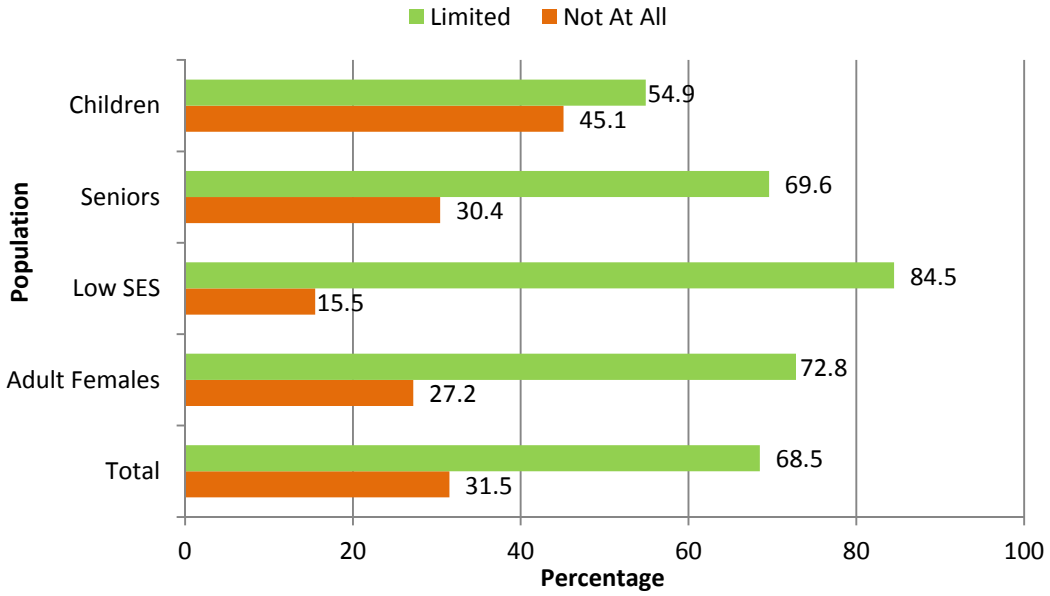


Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Activity Limitations by Priority Population

Almost one-third (31.5%) of West Virginians with current asthma reported having no activity limitations due to asthma within the past year (Figure 49). Individuals of low SES were significantly more likely to report activity limitations than all other populations. Children were significantly less likely to report activity limitations than all other priority populations. Adult females and seniors reported activity limitations nearly equally (72.8% and 69.6%, respectively).

Figure 49. Activity Limitations Due to Asthma in Past 12 Months, Current Asthma, West Virginia, 2007-2010

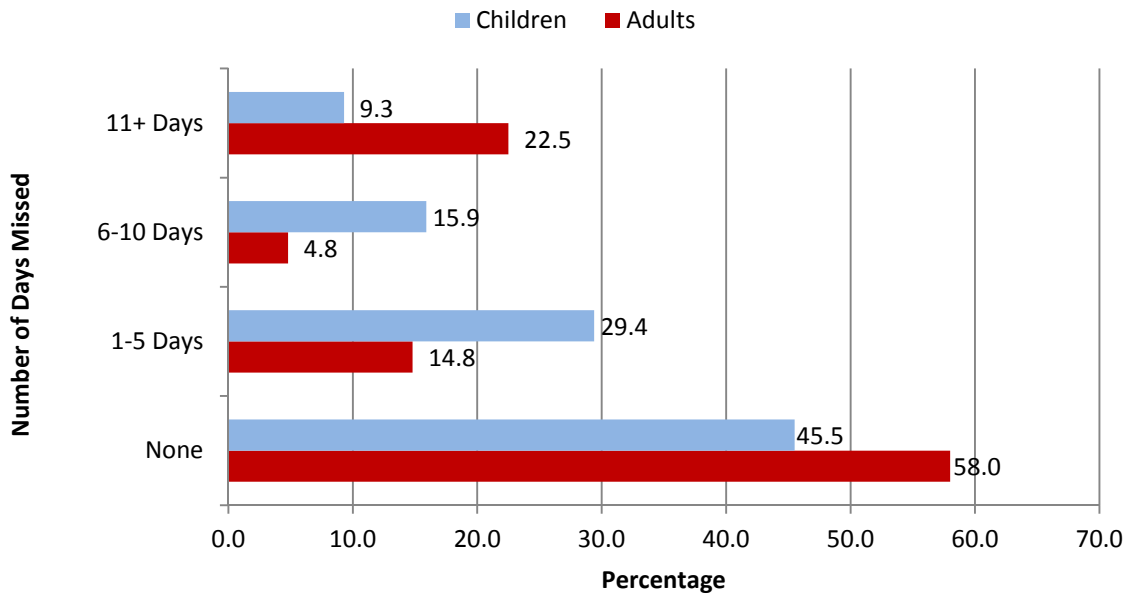


Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both ,"Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Missed School or Work Days

Among West Virginians with current asthma, about one in 10 children (9.3%) and nearly a quarter (22.5%) of adults reported missing 10 or more school or work days in the past year due to asthma (Figure 50). Among children who missed school days, a larger proportion missed 1-5 days in a year. Most adults and children reported that asthma did not prevent them from working or attending school (58.0% and 45.5% respectively).

Figure 50. Missed School or Work Days in Past Year, Current Asthma, West Virginia 2007-2010

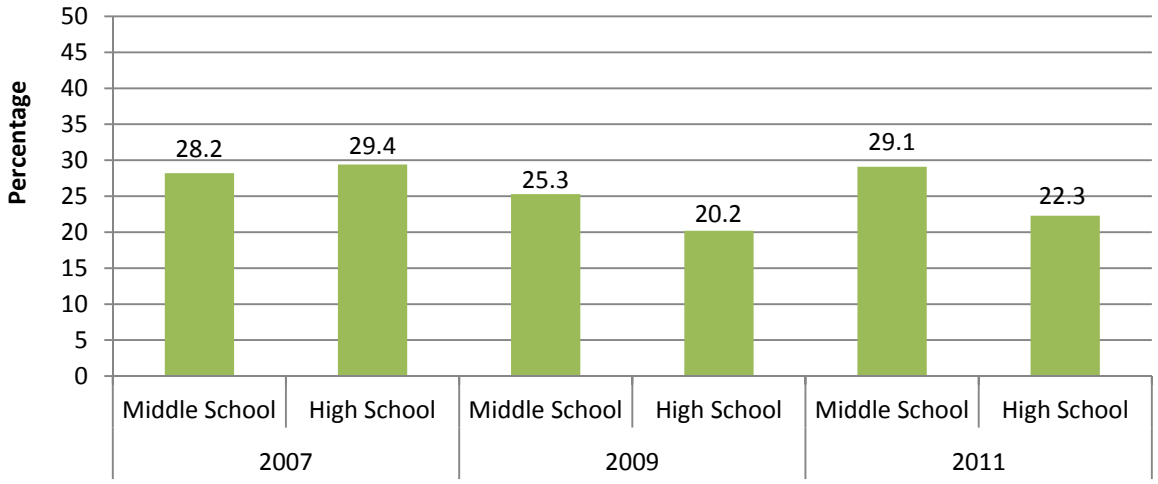


Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both, "Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Missed School Days – Youth Tobacco Survey

In 2011, more than 2,000 public middle and 2,500 high school students reported missing school because of asthma. The peak of high school students with current asthma reporting missed school days was in 2007 (29.4%) while middle school students reported missed days more in 2011 (Figure 51). There were no statistically significant differences noted.

Figure 51. Missed School Days, Middle and High School Students with Current Asthma, 2007-2011

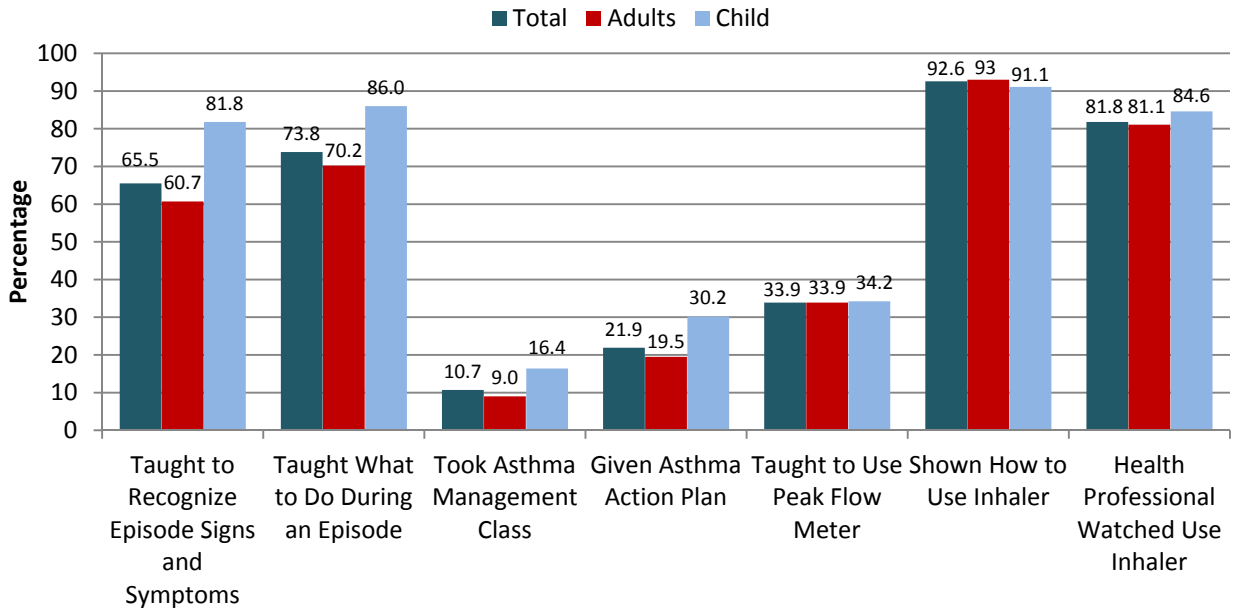


Data Source: West Virginia Department of Education, Youth Tobacco Survey; West Virginia Health Statistics Center
Population: West Virginia Middle and High School Students from Public Schools
Current Asthma: Responding "yes" to both ,"Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?"

Asthma Self-Management

Nearly all (94.1%) West Virginians with current asthma reported they had received at least one element of self-management. About one-third or fewer West Virginia residents with current asthma reported having taken an asthma management class, being given an asthma action plan, and being taught how to use a peak flow meter (Figure 52). Children reported higher percentage of self-management skills than adults except for having a health professional who watched them use an inhaler. Statistically significant differences between adults and children were observed in respect to being taught to recognize signs and symptoms, being taught what to do during an episode, being shown how to use an inhaler, and having a health professional watch while using an inhaler.

Figure 52. Self-Management Education, Current Asthma, West Virginia 2007-2010



Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey; West Virginia Health Statistics Center
Population: West Virginia Residents
Current Asthma: Responding "yes" to both ,"Have you ever been told by a doctor, nurse, or other health professional that you have asthma?" and "Do you still have asthma?"

Appendix A: Data Sources

Behavioral Risk Factor Surveillance System (BRFSS): The BRFSS survey is a state-based, ongoing, random-digit-dialed telephone survey of civilian, non-institutionalized adults ages 18 and older who live in the United States. Data on several topics are collected using the BRFSS, which allows for analysis of associations between various behaviors and asthma. The collection of these data has been occurring in a standard and reliable format for more than 25 years, allowing for analysis of time trends. Also, whereas a standard methodology is used in all states, state-to-state comparisons are allowed. More recently, the BRFSS has been expanded to include more cell phone surveys. BRFSS data must be interpreted with caution as data are self-reported. Additionally, individuals may have difficulty recalling past behaviors or may understate behaviors known to be unhealthy, socially unacceptable or illegal.

Since 2007, the BRFSS Asthma Call-back Survey (BRFSS ACS) was implemented in West Virginia as a follow-up to the BRFSS survey. Only one adult or child per household can participate in the ACS, which obtains in-depth information about asthma symptoms, episodes/attacks, self-management education, health care utilization and access, medication use, comorbidities, and environmental allergens and irritants. For additional information, visit: http://www.cdc.gov/brfss/. In order to maintain a level of consistency with our data reporting throughout the *Asthma Burden*, of the data presented here begins in 2007.

Youth Tobacco Survey: The West Virginia Youth Tobacco Survey (YTS) collects information on tobacco use, attitudes and knowledge regarding tobacco, exposure to tobacco-related media, exposure to environmental tobacco smoke, and asthma among adolescents. The YTS was most recently administered in 2007, 2009, and 2011. Only 6-12th graders enrolled in West Virginia public schools are eligible to participate in this survey. These data are self-reported and should be interpreted with caution. Individuals may have difficulty recalling past behavior or may misstate behaviors due to the sensitivity of the questions. For additional information visit:
http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm

Appendix B: Methodology

Multiple years of data were combined to create consistency between the BRFSS and BRFSS ACS. The number of individuals reported in tables (Appendix C) was an estimate for the midpoint of the specified timeframe.

Rate: Rates are calculated by dividing the number of events in a given time period by the number of people at risk of experiencing the event in that time period. Percentages are rates presented per 100 population.

95% Confidence Interval (95%CI): Confidence Intervals represent the range of values among which the true value would be found. This report presents the 95%CI, meaning that the true value would be within the given interval 95% of the time. Confidence intervals are mainly affected by the number of responses or events that the estimate is based on. If there is a small number of responses the estimate will typically have large confidence intervals.

Statistically Significant: In this report, rates are said to be statistically significant when the 95% CI associated with each of the rates does not overlap. It can be stated with 95% certainty that the difference found between the two rates is not a random occurrence.

Based on CDC recommendations, estimates in this report were termed unreliable if any of the three following conditions were met:

(1) The estimate is based on responses from fewer than 50 respondents in the subsample or denominator of the prevalence estimate calculation.
(2) The 95% CI of the estimate has a width or range greater than 20 (e.g., 95% CI = 10.0-30.5).
(3) The estimate has a relative standard error (RSE) of 30.0% or higher. The RSE is obtained by dividing the standard error of the estimate by the estimate itself. It is calculated by the SAS® software, a commonly used statistical software package.

Appendix C: Detailed Tables

Table 1. Levels of Asthma Control within Individual Control Components, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Well Controlled		Not Well Controlled		Very Poorly Controlled	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Daytime Symptoms	94,900	59.5 (55.7-63.2)	46,500	29.2 (25.7-32.7)	18,100	11.4 (9.3-13.4)
Nighttime Awakenings	109,200	69.5 (65.7-73.2)	22,300	14.2 (11.2-17.1)	25,800	16.4 (13.5-19.3)
Rescue Medications	113,400	69.4 (65.9-72.9)	20,600	12.6 (10.0-15.2)	29,400	18.0 (15.1-20.8)
Overall	75,900	46.5 (42.6-50.4)	37,800	23.1 (19.9-26.4)	49,600	30.4 (26.9-33.8)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
Note: Asthma control level was determined based on NAEPP guidelines.
Well controlled: Asthma symptoms ≤8 days in past 30 days, nighttime awakenings ≤2 times in past 30 days, and rescue medication used ≤0.29 times per day.
Not well controlled: Asthma symptoms >8 days in past 30 days, nighttime awakenings 3-12 times in the past 30 days, or rescue medication used >0.29 to <2.00 times per day.
Very poorly controlled: Asthma symptoms every day in the past 30 days and throughout the day, nighttime awakenings ≥13 times in the past 30 days, or rescue medication used ≥2.00 times per day.

Table 2. Prevalence of Asthma Control Level, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Well Controlled		Not Well Controlled		Very Poorly Controlled	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Total Adults	54,900	43.8 (39.3-48.3)	28,900	23.0 (19.4-26.7)	41,600	33.2 (29.2-37.2)
Adult Females	37,300	45.7 (40.4-51.0)	20,300	24.9 (20.7-29.1)	24,000	29.4 (25.1-33.8)
Adult Males	17,600	40.2 (32.0-48.3)	8,600	19.6 (12.5-26.6)	17,600	40.2 (32.3-48.2)
Low SES[c]	5,600	32.9 (22.6-43.2)*	3,400	19.6 (12.5-26.7)	8,100	47.5 (37.3-57.6)*
Higher SES[c]	47,200	46.0 (41.0-51.0)	24,300	23.7 (19.4-27.9)	31,200	30.4 (26.0-34.8)
Seniors	8,300	34.4 (28.1-40.7)	5,900	24.7 (19.2-30.2)	9,800	40.8 (34.3-47.4)
Children	21,000	55.4 (47.3-63.5)	8,900	23.6 (16.5-30.6)	8,000	21.1 (14.1-28.1)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of residents with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Low SES: Income ≤$25,000 and education < high school diploma; High SES: Income >$25,000 and education ≥ high school diploma
*Use caution interpreting this estimate. It does not meet one or more reliability criteria.
Note: Asthma control level was determined based on NAEPP guidelines.
Well controlled: Asthma symptoms ≤8 days in past 30 days, nighttime awakenings ≤2 times in past 30 days, and rescue medication used ≤0.29 times per day.
Not well controlled: Asthma symptoms >8 days in past 30 days, nighttime awakenings 3-12 times in the past 30 days, or rescue medication used >0.29 to <2.00 times per day.
Very poorly controlled: Asthma symptoms every day in the past 30 days and throughout the day, nighttime awakenings ≥13 times in the past 30 days, or rescue medication used ≥2.00 times per day.

Table 3. Daytime Asthma Symptoms, in Past Month, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Total		Adults		Children	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
None	51,800	32.5 (28.7-36.2)	36,300	29.6 (25.4-33.9)	15,500	42.0 (33.9-50.0)
1-5 Days	36,700	23.0 (19.4-26.6)	25,500	20.8 (16.8-24.8)	11,200	30.4 (22.4-38.3)
6-10 Days	12,800	8.0 (6.2-9.9)	9,600	7.8 (5.7-9.9)	3,200	8.7 (4.8-12.7)
11-29 Days	23,600	14.8 (12.0-17.6)	18,200	14.9 (11.7-18.0)	5,400	14.7 (8.8-20.5)
Daily	34,500	21.6 (18.7-24.5)	33,000	26.9 (23.2-30.5)	1,600	4.3 (1.4-7.2)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 4. Nighttime Awakenings in Past Month, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Total		Adults		Children	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
None	99,500	60.9 (57.1-64.7)	75,500	62.7 (58.3-67.1)	24,000	65.0 (56.8-73.3)
1-5 Days	25,700	15.7 (12.7-18.7)	17,100	14.2 (10.9-17.4)	8,600	23.3 (15.6-31.0)
6-10 Days	6,600	4.0 (2.7-5.3)	5,300	4.4 (2.8-6.0)	1,300	3.6 (1.1-6.0)
11+ Days	31,600	19.3 (16.3-22.3)	22,500	18.7 (15.2-22.2)	4,000	8.1 (3.6-12.6)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 5. Asthma Medication Use in Past 3 Months, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Total		Adults		Children	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Pills	45,900	28.9 (25.4-32.4)	30,600	25.2 (21.5-28.9)	15,300	40.7 (32.6-48.9)
Inhaler	100,000	64.3 (60.5-68.1)	80,300	67.1 (62.8-71.5)	19,700	54.8 (46.7-63.0)
Syrup	4,700	3.0 (1.4-4.5)	2,200	1.8 (0.3-3.4)	2,500	6.6 (2.5-10.6)
Control	73,800	46.3 (42.4-50.2)	51,900	42.3 (37.9-46.6)	21,900	59.6 (51.7-67.4)
Rescue	98,200	85.3 (82.1-88.5)	73,600	84.5 (80.6-88.4)	24,600	87.7 (83.0-92.5)
Any CAM[§] Use	56,300	34.8 (31.1-38.4)	45,600	36.6 (32.4-40.7)	10,700	28.8 (21.4-36.2)
CAM Use includes the following therapies:						
Herbs	6,300	3.9 (2.2-5.5)	5,700	4.6 (2.5-6.6)	600	1.6 (0.0-3.6)
Vitamins	11,900	7.3 (5.6-9.0)	9,800	7.9 (5.9-9.8)	2,000	5.4 (2.1-8.8)
Acupuncture	500	0.3 (0.0-0.6)	500	0.4 (0.0-0.7)		
Acupressure	400	0.2 (0.0-0.4)	300	0.2 (0.0-0.5)	100	0.2 (0.0-0.6)
Aromatherapy	6,500	4.0 (2.6-5.4)	5,300	4.2 (2.5-5.9)	1,200	3.2 (0.9-5.5)
Homeopathy	3,300	2.0 (0.6-3.4)	2,800	2.2 (0.5-3.9)	500	1.4 (0.0-3.5)
Reflexology	1,800	1.1 (0.3-1.8)	1,400	1.1 (0.3-2.0)	300	0.9 (0.0-2.7)
Yoga	4,900	3.0 (1.5-4.6)	4,300	3.4 (1.7-5.2)	600	1.7 (0.0-5.1)
Breathing Technique	40,800	25.1 (21.8-28.4)	33,800	27.0 (23.2-30.8)	7,000	18.7 (12.1-25.4)
Naturopathy	1,300	0.8 (0.0-1.6)	600	0.5 (0.1-0.9)	600	1.7 (0.0-5.1)
Other CAM Use	14,800	9.1 (6.8-11.4)	10,600	8.4 (5.9-11.0)	4,200	11.3 (6.1-16.5)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
§ Complementary and Alternative Medicine

Table 6. Frequency of Asthma Episodes in Past 3 Months, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Total		Adults		Children	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
None	32,900	32.4 (27.6-37.2)	24,900	32.0 (26.5-37.5)	8,000	33.8 (24.3-43.3)
One	17,400	17.2 (13.5-20.8)	12,400	15.9 (11.8-19.9)	5,100	21.5 (13.1-29.9)
2-3	22,700	22.3 (18.1-26.5)	15,800	20.2 (15.8-24.7)	6,900	29.3 (19.0-39.6)
4+	28,500	28.1 (23.5-32.7)	24,900	31.9 (26.4-37.4)	3,600	15.4 (7.7-23.1)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of residents with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 7. Experienced Asthma Episode in Past Year, Public Middle and High School Students, Current Asthma[a], West Virginia, 2007-2011, YTS						
	2007		2009		2011	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Middle School	3,000	48.9 (39.0-58.9)	3,500	44.4 (37.9-50.9)	4,700	47.1 (41.4-52.9)
High School	5,000	56.4 (47.8-64.9)	4,000	43.2 (33.8-52.5)	4,500	43.3 (35.2-51.4)

Data Source: West Virginia Department of Education, Youth Tobacco Survey, West Virginia Health Statistics Center
Population: West Virginia Public School Students Grades 6-12
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of students with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 8. Most Recent Asthma Symptoms, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Total		Adults		Children	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
<1 Week Ago	77,800	48.4 (44.6-52.3)	66,000	53.8 (49.3-58.3)	11,700	31.1 (23.5-38.7)
1 Week - <3 Months Ago	41,900	26.1 (22.5-29.6)	27,300	22.3 (18.4-26.2)	14,500	38.4 (30.4-46.4)
3 Months - <1 Year Ago	23,900	14.9 (12.1-17.7)	15,200	12.4 (9.3-15.4)	8,800	23.2 (16.5-29.9)
More than 1 Year Ago	16,900	10.1 (7.7-12.5)	13,700	11.1 (8.1-14.1)	3,000	6.8 (3.4-10.1)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of residents with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 9. Activity Limitations in Past Year, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS				
	Limitations		No Limitations	
	Number[b]	% (95% CI)	Number	% (95% CI)
Total	111,300	68.5 (64.9-72.2)	51,100	31.5 (27.8-35.1)
Adult Males	31,700	72.4 (64.9-79.9)	12,100	27.6 (20.1-35.1)
Adult Females	58,900	72.8 (68.2-77.5)	22,000	27.2 (22.5-31.8)
Low SES[c]	14,500	84.5 (77.8-91.1)	2,700	15.5 (8.9-22.2)
Higher SES[c]	71,000	69.6 (65.0-74.2)	31,000	30.4 (25.8-35.0)
Seniors	16,500	69.6 (63.5-75.7)	7,200	30.4 (24.3-36.5)
Children	20,800	54.9 (46.8-63.0)	17,100	45.1 (37.0-53.2)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of residents with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
c. Low SES: Income ≤$25,000 and education < high school diploma; High SES: Income >$25,000 and education ≥ high school diploma

Table 10. Missed School or Work Days in Past Year, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS				
	Adults		Children	
	Number[b]	% (95% CI)	Number	% (95% CI)
None	64,400	58.0 (53.3-62.7)	14,900	45.3 (37.0-53.6)
1-5 Days	16,400	14.8 (11.3-18.2)	9,700	29.5 (22.0-37.1)
6-10 Days	5,300	4.8 (3.0-6.6)	5,200	15.9 (9.6-22.1)
11+ Days	24,900	22.5 (18.4-26.5)	3,100	9.3 (4.5-14.1)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.

Table 11. Missed School Days in Past Year, Public Middle and High School Students, Current Asthma[a], West Virginia, 2007-2011, YTS						
	2007		2009		2011	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Middle School	1,800	28.2 (18.8-37.7)	1,900	25.3 (17.1-33.5)	2,500	29.1 (22.3-35.9)
High School	2,600	29.4 (19.3-39.6)*	2,000	20.2 (12.8-27.5)	2,000	22.3 (14.1-30.6)

Data Source: West Virginia Department of Education, Youth Tobacco Survey, West Virginia Health Statistics Center
Population: West Virginia Public School Students Grades 6-12
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.
* Use caution interpreting this estimate. It does not meet one or more reliability criteria.

Table 12. Self-Management Education, Current Asthma[a], West Virginia, 2007-2010, BRFSS ACS						
	Total		Adults		Children	
	Number[b]	% (95% CI)	Number	% (95% CI)	Number	% (95% CI)
Taught Episode Signs and Symptoms	104,500	65.5 (62.0-69.1)	74,600	60.7 (56.4-64.9)	29,900	81.8 (75.8-87.8)
Taught Episode Response	119,100	73.8 (70.6-77.0)	87,100	70.2 (66.3-74.0)	32,100	86.0 (81.0-91.1)
Took Asthma Management Class	17,500	10.7 (8.2-13.3)	11,300	9.0 (6.4-11.7)	6,200	16.4 (9.9-22.9)
Given Action Plan	34,800	21.9 (18.3-25.5)	23,800	19.5 (15.3-23.6)	11,000	30.2 (22.6-37.8)
Taught to Use Peak Flow Meter	55,100	33.9 (30.2-37.7)	42,300	33.9 (29.5-38.2)	12,800	34.2 (26.6-41.7)
Shown to Use Inhaler	137,700	92.6 (90.3-95.0)	110,500	93.0 (90.7-95.3)	27,200	91.1 (84.2-98.1)
Health Professional Watched Use Inhaler	118,400	81.8 (78.6-84.9)	93,500	81.1 (77.4-84.7)	24,900	84.6 (78.2-91.0)
Reported Self-Management Element	153,700	94.1 (92.2-95.9)	117,300	93.5 (91.3-95.7)	36,500	96.0 (92.9-99.1)

Data Source: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, West Virginia Health Statistics Center
Population: West Virginia Residents
a. Current Asthma: Responding "yes" to both the lifetime asthma question and "Do you still have asthma?"
b. Estimated number of adults with asthma. This number is the weighted frequency calculated by SAS software, rounded to the nearest hundred.