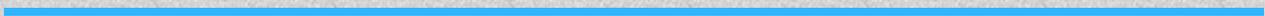
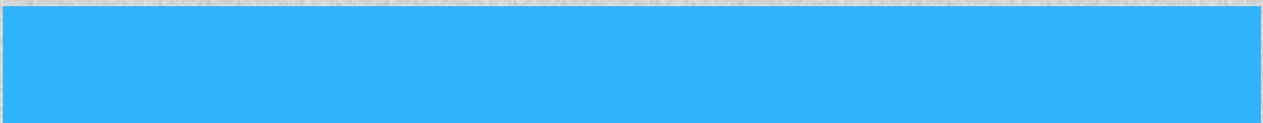

Kentucky Asthma Surveillance Report 2008-2012

Kentucky Asthma Management Program
Kentucky Department for Public Health
Kentucky Cabinet for Health and Family Services



THE BURDEN OF ASTHMA IN KENTUCKY



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EXECUTIVE SUMMARY

The U.S. Centers for Disease Control and Prevention (CDC), through the Behavioral Risk Factor Surveillance Survey (BRFSS), estimates that 25.9 million people in the United States, including almost 7.1 million children, report having been diagnosed with asthma. In Kentucky, the 2012 BRFSS estimates that 370,000 Kentucky adults and 106,400 children currently have asthma and asthma prevalence continues to increase.

The disease creates an enormous toll in terms of disability, diminished quality of life, lost productivity and health care costs. Asthma accounted for more than 15 million provider and hospital outpatient visits, and nearly 2 million emergency department (ED) visits in the United States in 2010. Asthma costs the U.S. healthcare system \$56 billion annually in both direct expenditures and indirect costs from lost productivity, according to the CDC. In 2010, the CDC estimated that asthma cost Kentucky \$399 million in direct costs.¹

In 2012, more than 5,800 Kentucky residents were hospitalized for asthma as a primary diagnosis, and more than 19,400 Kentucky residents had ED visits for asthma as a primary diagnosis. Asthma is the third-leading cause of hospitalization for children in Kentucky, and those under five years of age had the highest age-adjusted hospitalization rate in 2012.

Asthma is also one of the leading causes of school absenteeism in Kentucky. Children with asthma miss an average of four school days each year, and some children in Kentucky miss many more days, resulting in an estimated annual loss of \$10 million to school districts. Among adults with asthma, almost four in 10 were unable to work or carry out their usual activities because of asthma. Missed work days cost Kentuckians \$46 million in indirect costs in 2010.²

Some populations in Kentucky are disproportionately affected by asthma including children, adult women, particularly those who are overweight or obese, blacks, families who fall below the federal poverty level, people with lower levels of education and people who live in Appalachia. Over 21 percent of adults who currently have asthma reported not having any type of insurance in 2012.

Through the Kentucky Department for Public Health's Asthma Management Program and the Kentucky Asthma Partnership, the state is addressing its asthma burden using a collaborative planning process and evidence based interventions. State funding and the CDC cooperative agreement "Addressing Asthma From a Public Health Perspective" has created infrastructure for program planning and implementation. Kentucky data demonstrates that although prevalence is increasing, hospitalizations for asthma are decreasing which is a clear indication that best practices including adherence to standards of care and self-management education are working. Kentucky Governor Steven L. Beshear has created the kentuckyhealthnow initiative which supports 100% Tobacco Free Schools and a statewide Smokefree Kentucky law to lower exposure to secondhand smoke in a state with one of the highest smoking rates in the nation. The Kentucky Health Benefit Exchange and the expansion of Medicaid in Kentucky is helping with access issues especially for those with low income. The data in this report will guide the collaborative revision of the Kentucky Asthma Strategic Plan which focuses on reducing the burden of asthma for Kentuckians.

KEY FINDINGS

Prevalence

Adults

- Lifetime asthma prevalence among adults increased from 13.3% in 2005 to 16.0% in 2012
- Current asthma prevalence increased from 8.8% in 2005 to 11.1% in 2012
- The combined 2011- 2012 current asthma prevalence was highest in the 55-64 age group (12.3%)
- In 2012, females (13.6%) had higher current asthma prevalence than males (8.4%)

Children

- In 2012, current asthma prevalence was 10.2%, an increase from 9.3% in 2006
- In 2012, current asthma prevalence was higher in boys (12.1%) than in girls (8.3%)
- In public schools, 13.8% of middle school students and 13.6% of high school students reported current asthma in 2010

Risk Factors Associated with Asthma

- In 2012, current adult asthma prevalence was higher among current smokers (14.5%) than among those who had never smoked (8.4%)
- In 2010, public middle school (15.1%) and high school (14.6%) students living with a smoker reported higher current asthma prevalence than those who did not
- In 2011, adults with asthma were exposed to many indoor environmental triggers. KY BRFSS shows 65.5% had carpets or rugs in the bedroom, 59.1% had pets inside the home, 48.3% allowed pets in the bedroom and 34.3% had a smoker in the home in the last week
- In 2012, adults with lowest levels of formal education had more than twice the rate of asthma prevalence (17.2%) than those with a college degree (7.6%)
- In 2012, asthma prevalence was three times higher among those with lowest levels of income (19.8%) compared to those with highest income (6.6%)
- In 2012, obese adults had higher current asthma prevalence (15.4) than normal weight adults (8.9%)

Living With Asthma

According to data from the Kentucky BRFSS Adult Asthma Callback Survey (ACBS) 2011:

- Approximately nine in 10 adults with current asthma reported asthma symptoms at least once in the past 30 days, and four in 10 adults reported asthma symptoms every day
- Only half of adults with current asthma (288,830 or 54.5%) had talked to a doctor or other health professional about their asthma within the past 12 months
- Among adults with current asthma, 14% visited an ED or urgent care center the previous year
- Among adults with current asthma, 21% did not have health insurance
- Four in 10 adults were unable to work or carry out their usual activities because of their asthma during the past 12 months
- Many adults with current asthma had other comorbid conditions such as emphysema (17.2%), chronic obstructive pulmonary disease (24.4%), chronic bronchitis (42.5%), or depression (45.9%)

Work-Related Asthma

- According to the Adult Asthma Call Back Survey (ACBS) 2011, 40.7% of currently employed adults with asthma reported their asthma was caused by or made worse by a current job

- Among adults with asthma who had ever been employed, 43.8% reported their asthma was caused or made worse by a previous job

Health Care Utilization

Inpatient Hospitalizations in 2012

- Kentucky reported 5,826 hospitalizations with asthma as the primary diagnosis with an average charge of \$14,771 per hospitalization and an average length of stay of 3.48 days
- The total direct charges due to asthma hospitalizations in Kentucky were \$86 million
- Medicaid was the most frequent payor responsible for 34.6% of the total charges
- Asthma was the third leading cause of hospitalization among children under 18
- The highest hospitalization rate was in the under 5 age group

Emergency Department Visits in 2012

- There were 19,455 ED visits for asthma with total charges of over \$35 million
- The highest proportion of visits occurred in the under 5 age group (16% of total ED visits)
- The number of visits were higher in early fall and early spring

Asthma in the Medicaid Population

- In Kentucky between 2008 and 2011 the prevalence of asthma remained stable in the fee-for-service group under age 65
- The rate of outpatient visit rates was highest in the 5-to-17 year age group
- ED visits among Medicaid recipients decreased each year
- Children less than 5 years of age had the highest number of ED visits

Mortality

- Asthma deaths have declined in Kentucky from 1.5 deaths per 100,000 population in 2001 to 0.7 deaths per 100,000 population in 2011, similar to U.S. mortality trends
- The age-adjusted asthma mortality rate was higher in females than in males each year from 2005 to 2011
- The five year (2007-2011) age-adjusted rate showed that blacks were two times more likely to die from asthma than whites
- The five-year age-adjusted mortality rate in Kentucky showed that blacks were two times more likely to die from asthma than whites, similar to the U.S. rate.

CHAPTER 1: INTRODUCTION

Asthma is a common chronic respiratory disease affecting the lives of millions of adults and children in the United States. It is characterized by periods of reversible obstruction of the airways (bronchi) known as asthma exacerbations or attacks. Airways are narrowed by swelling of the inner lining of the airways, tightening of the small muscles surrounding the airways and increased mucus production within the airways in reaction to certain stimuli or exposures. Exposures may include allergens (e.g. pollen, mold, dust mite or animal dander), airway infections, tobacco smoke and other factors such as exercise, cold or stress. The result of these exposures can be wheezing, shortness of breath, coughing and chest tightness or pain.³ The asthma attack can be mild, moderate or severe and can occasionally result in death if symptoms are not monitored or if proper medications are not administered. Although there is no cure for asthma and it is not clear how to prevent asthma from developing, there are effective interventions available to control and prevent asthma exacerbations.

The purpose of the 2013 Kentucky Asthma Surveillance Report is to inform key stakeholders including the Kentucky Asthma Partnership, providers, employers, school staff, executive branch and legislative decision makers, advocates and individuals and families about the prevalence, costs and risk factors related to asthma in Kentucky.

The burden of asthma in Kentucky is described using data related to asthma prevalence, risk factors, quality of life measures, health care utilization, health care costs and mortality. Also included in this report are appendices containing detailed tables of the data presented and descriptions of each data source. This data is designed to be useful to a wide audience of stakeholders as it will be used as a guide to focus asthma interventions and policies. It can also be used to measure progress in decreasing the burden of asthma and in improving the health outcomes of individuals with asthma in Kentucky.

In 2003, in order to begin addressing asthma as a public health issue the Kentucky Department for Public Health convened partners from across the state including universities, providers, local health departments and the American Lung Association of the Midland States to form the Kentucky Asthma Partnership (KAP).

In December of 2007, the Kentucky Department for Public Health (KDPH) established the Kentucky Asthma Management Program in its Chronic Disease Prevention Branch using state and CDC Preventive Health and Health Services Block Grant funds to support a program manager and an epidemiologist. With this infrastructure established, KDPH commissioned work on the first comprehensive *Kentucky Asthma Surveillance Report* which was published in 2009.⁴

Based on the surveillance document data, the Kentucky Asthma Partnership created a strategic plan called *The 2009 Kentucky State Plan for Addressing Asthma*, which prioritized goals, objectives and activities recommended for statewide action to reduce the burden of asthma in Kentucky.⁵ In 2009, Kentucky was also awarded a CDC grant (*Addressing Asthma from a Public Health Perspective*) to continue to develop infrastructure, training, and data surveillance in the state.

This 2013 report includes new sources of asthma data that have become available since the 2009 report was published including Medicaid data, National Child Health Survey analysis and adult Asthma Call Back Survey data which will help to define problems associated with worksite exposure and exacerbation, home environment and triggers, and asthma self-management. This data will once again guide strategic planning for managing asthma in Kentucky.

The analysis of comprehensive asthma data resulted in the creation of “Action Against Asthma,” a strategic plan for the Department of Health and Human Services in 2000 with specific objectives to reduce the burden of asthma in the United States.⁶ These objectives were retained as asthma goals and objectives in Healthy People 2020 (Appendix B).⁷ These objectives have guided the Kentucky Asthma Management Program in developing the Kentucky Strategic Plan for 2014.

The data analyzed for this Kentucky Asthma Surveillance Report corresponds to the data required to establish baselines, to select disparate populations and to develop appropriate strategies and interventions designed to improve overall asthma care and self-management and reduce emergency room visits, hospitalizations and missed school days. The data also assists with evaluation and performance measurement for the Kentucky Asthma Management Program and assesses progress toward reducing the burden of asthma in the state.

CHAPTER 2: ASTHMA PREVALENCE

Prevalence is a measure of the number of people in the population affected by asthma at a specific point in time. Examining prevalence data allows us to identify which populations are disproportionately affected by asthma and where intervention efforts should be directed.

BRFSS data was used to estimate lifetime and current asthma prevalence in Kentucky adults age 18 and older (see Appendix A). Lifetime prevalence estimates are based on respondents who answer yes to the following question: *“Have you ever been told by a doctor, nurse or health professional that you had asthma?”* Current prevalence estimates are based on respondents who answer yes to the lifetime prevalence question and yes to the following question: *“Do you still have asthma?”*

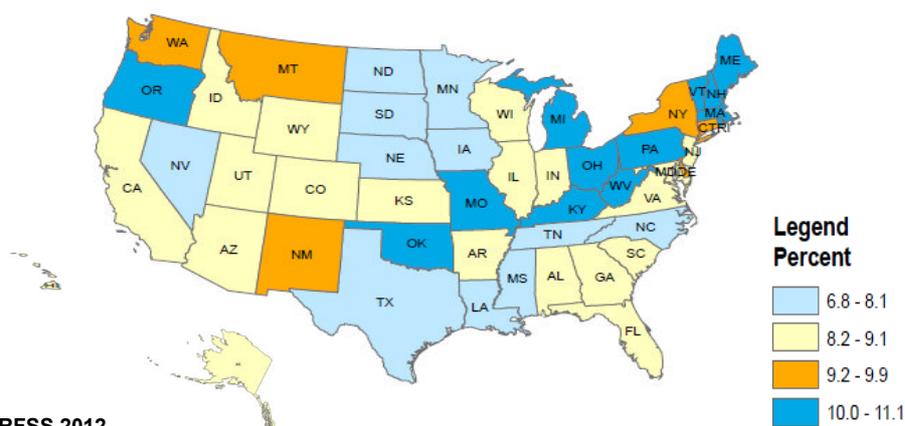
The BRFSS is a useful means of estimating the prevalence of asthma, but it has some limitations (see Appendix A). The information presented in this section includes analyses of 2004-2012 BRFSS data. In 2011, the BRFSS survey methodology had two major changes including the addition of cell phones to the sampling frame and adoption of a new weighting procedure, known as Iterative Proportional Fitting or Raking. Because of this change in methodology, data from 2011 onward is not directly comparable to data from previous years.

The information presented here examines the characteristics of asthma in Kentucky’s adults and children. Demographic variables examined include age, gender, race/ethnicity and area development district (ADD) of residence. Prevalence rates are presented along with 95% confidence intervals (95% CI).

Adult prevalence (≥18 years)

In 2012, adult current asthma prevalence across the United States ranged from 6.8% to 11.1% (Map 1). Kentucky’s 2012 current asthma prevalence of 11.1% falls in the top quartile compared to all other states.

Map 1: Adult Current Asthma Prevalence by State 2012



Data Source: U.S. BRFSS 2012

Lifetime Asthma Prevalence

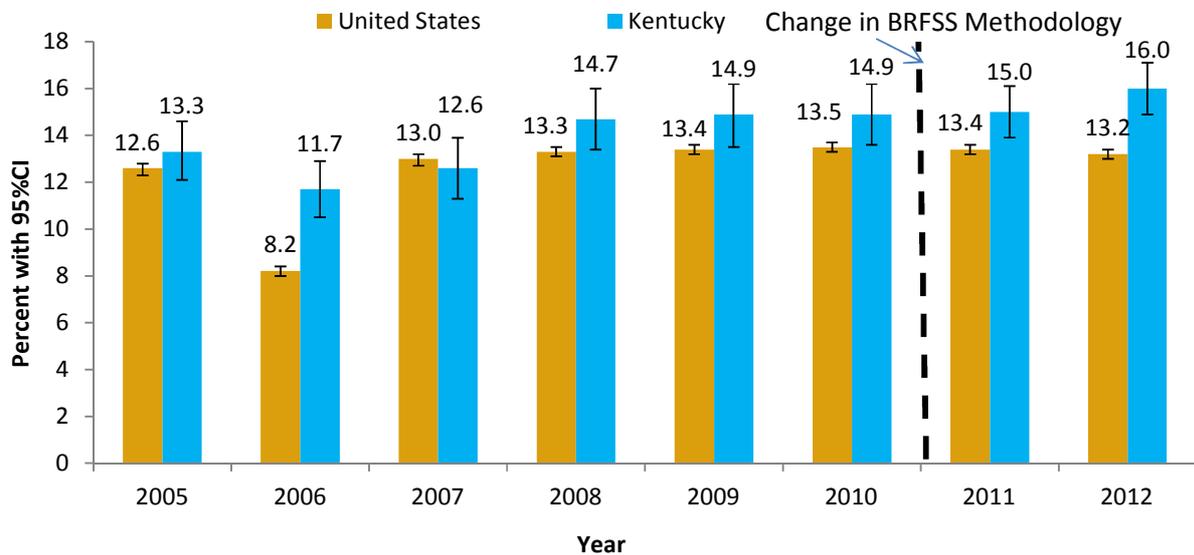
In 2012, the estimated lifetime asthma prevalence among adults in Kentucky was 16.0% (95% CI, 14.9-17.1) (Table 1). The estimated lifetime asthma prevalence among Kentucky adults has been higher than the United States since 2005 (Figure 1).

Table 1: Lifetime Asthma Prevalence among Adults by Year, Kentucky 2005-2012

Year	Lifetime Asthma Prevalence % (95% CI)
2005	13.3 (12.1 - 14.6)
2006	11.7 (10.5 - 12.9)
2007	12.6 (11.3 - 13.9)
2008	14.7 (13.4 - 16.0)
2009	14.9 (13.5 - 16.2)
2010	14.9 (13.6 - 16.2)
2011	15.0 (13.9 - 16.1)
2012	16.0 (14.9 - 17.1)

Data Source: KY BRFSS 2005-2012. Note: BRFSS 2010 data is not considered comparable to BRFSS 2011 data because of a change in methodology.

Figure 1: Lifetime Adult Asthma Prevalence by Year, Kentucky and United States 2005-2012 with 95% Confidence Intervals



Data Source: KY BRFSS 2005-2012; U.S. BRFSS data from www.cdc.gov/brfss. Note: BRFSS 2010 data is not considered comparable to BRFSS 2011 data because of a change in methodology.

Current Asthma Prevalence

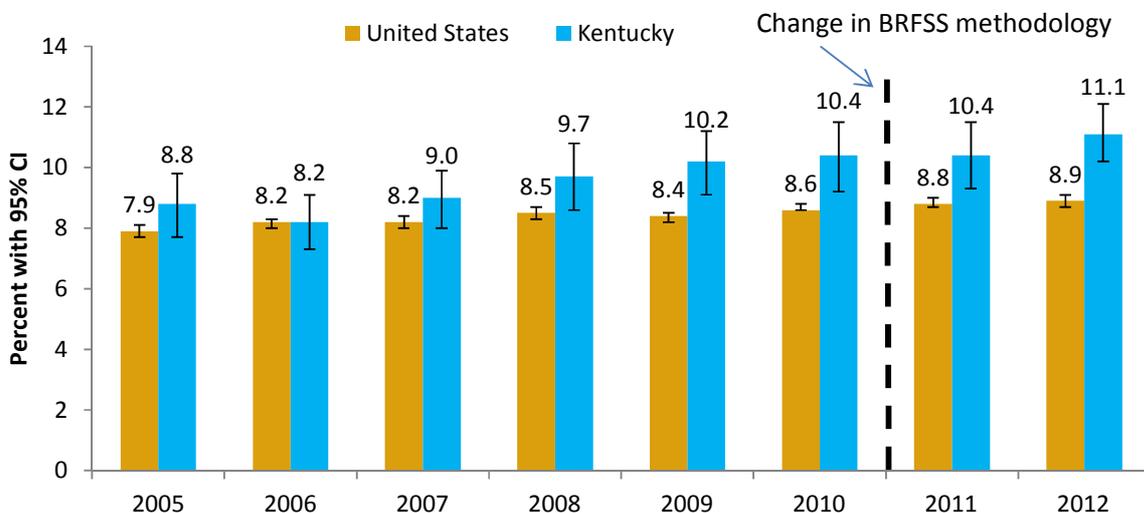
The estimated prevalence of current asthma among adults in Kentucky for 2012 was 11.1% (95% CI, 10.1 – 12.0) (Table 2). The estimated prevalence of current asthma among Kentucky adults has been higher than U.S. adults since 2005 (Figure 2).

Table 2: Current Asthma Prevalence among Adults by Year, Kentucky 2005-2012

Year	Current Asthma Prevalence % (95% CI)
2005	8.8 (7.9 - 9.7)
2006	8.2 (7.2 - 9.1)
2007	9.0 (7.9 - 10.1)
2008	9.7 (8.6 - 10.7)
2009	10.2 (9.0 - 11.3)
2010	10.4 (9.3 - 11.5)
2011	10.4 (9.5 -11.4)
2012	11.1 (10.1-12.0)

Data Source: KY BRFSS 2005-2012

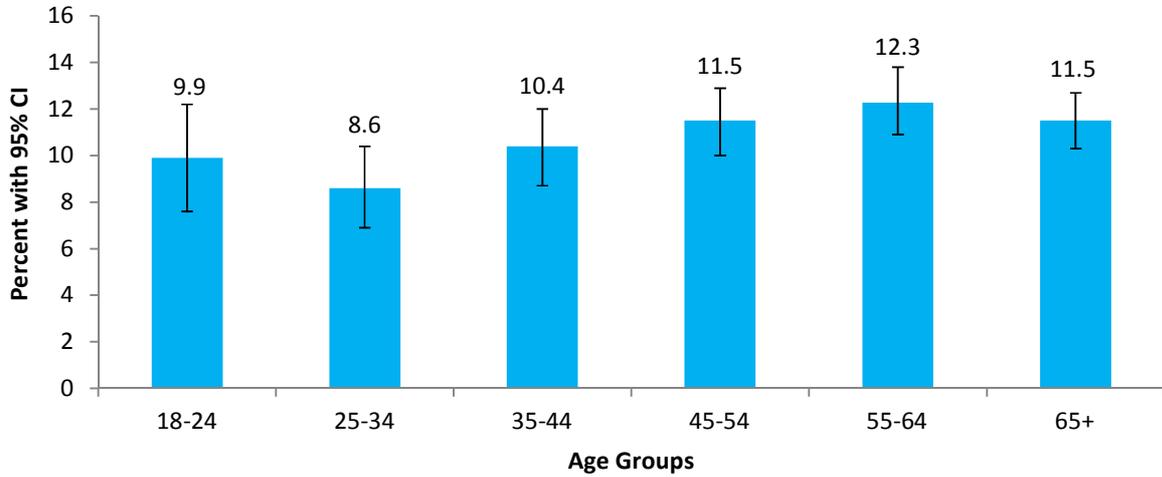
Figure 2: Current Adult Asthma Prevalence by Year, Kentucky and United States 2005-2012, with 95% Confidence Intervals



Data Source: KY BRFSS 2005-2012; U.S. BRFSS data from www.cdc.gov/brfss. Note: BRFSS 2010 data is not considered comparable to BRFSS 2011 data.

Current asthma prevalence was lowest among those age 25-34 and highest among those age 55-64 (12.3%) in 2011-2012 (Figure 3).

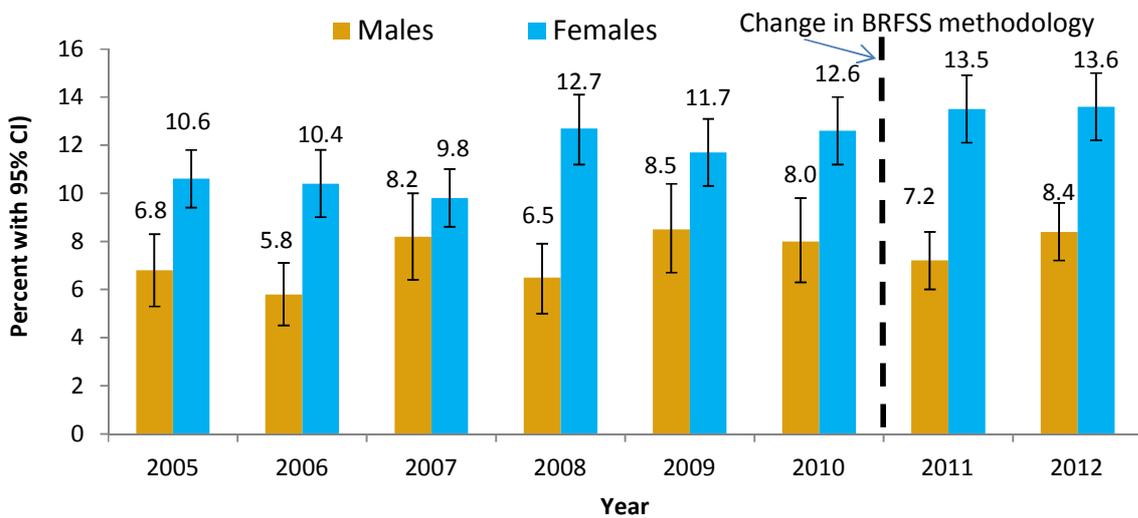
Figure 3: Current Asthma Prevalence among Adults by Age Group, Kentucky 2011-2012



Data source: CDC KY BRFSS 2011 & 2012

Current asthma prevalence was consistently higher among females compared to males between 2005 and 2012, as is consistent with national data. In 2012, current asthma prevalence was significantly higher among females (13.6%) than males (8.4 %) (Figure 4).

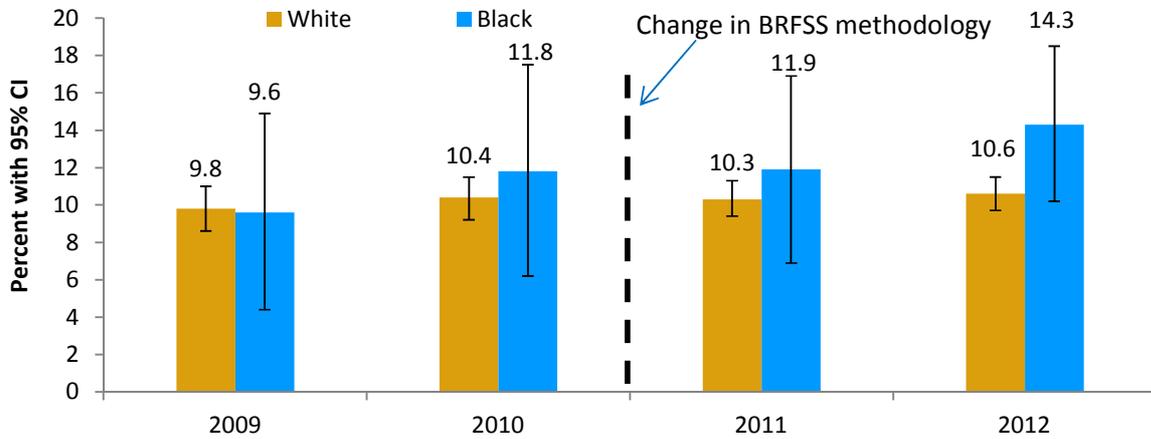
Figure 4: Current Asthma Prevalence Among Adults by Gender and Year, Kentucky 2005-2012



Data Source: KY BRFSS 2005-2012

National data show that blacks have higher asthma prevalence rates than whites. We see the same pattern in Kentucky data but it is not statistically significant. In 2012, current asthma prevalence was 10.6% among whites compared to 14.3% among blacks (Figure 5).

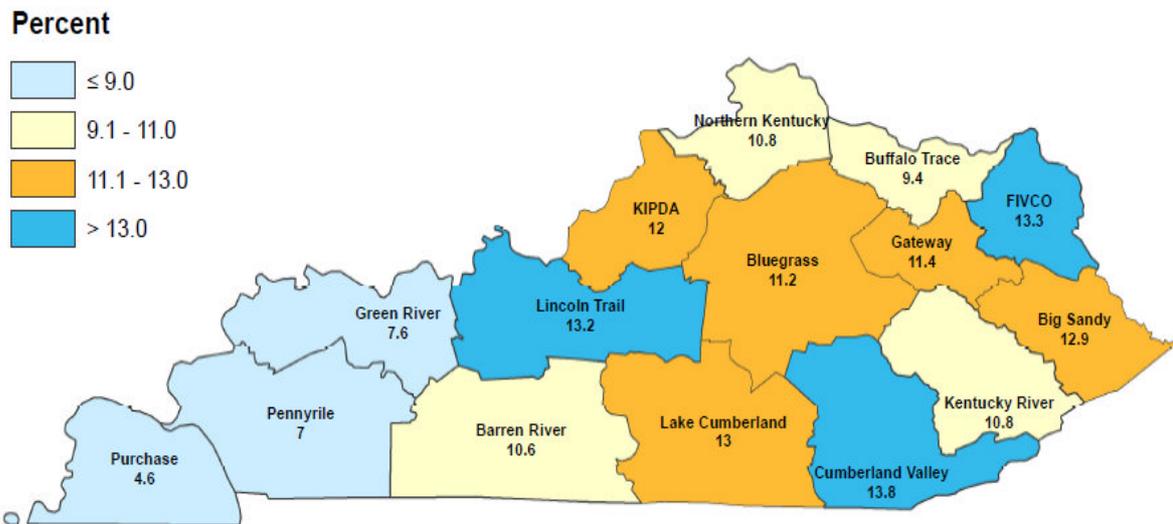
Figure 5: Current Asthma Prevalence among Adults by Race, Kentucky 2009-2012



Data Source: KY BRFSS 2009-2012 from <http://apps.nccd.cdc.gov/brfss/race/KY>; BRFSS 2010 data is not considered comparable to BRFSS 2011 data because of a change in methodology.

Adult asthma prevalence varies a great deal across Kentucky. (Map 2) Current asthma prevalence was highest in the Cumberland Valley, FIVCO and Lincoln Trail Area Development Districts (ADDs). At least 11 of Kentucky’s 15 ADDs have an adult asthma prevalence rate higher than the national rate of 8.9% (Table 3).

Map 2: Prevalence of Current Asthma among Adults by Area Development Districts, Kentucky 2012



Data source: KY BRFSS 2012

Table 3: Prevalence of Current Asthma among Adults by Kentucky Area Development Districts and U.S. 2012

Area Development District	Adults (%) with (95%CI)
Purchase	4.6 (2.9 - 6.3)
Pennyrile	7.0 (4.8 - 9.2)
Green River	7.6 (4.9 - 10.2)
Buffalo Trace	9.4 (5.1 - 13.6)
Barren River	10.6 (7.0 - 14.2)
Kentucky River	10.8 (7.8 - 13.9)
Northern Kentucky	10.8 (7.9 - 13.8)
Bluegrass	11.2 (8.7 - 13.6)
Gateway	11.4 (6.6 - 16.2)
KIPDA	12.0 (9.5 - 14.5)
Big Sandy	12.9 (9.2 - 16.6)
Lake Cumberland	13.0 (9.6 - 16.3)
Lincoln Trail	13.2 (9.3 - 17.0)
FIVCO	13.3 (9.8 - 16.7)
Cumberland Valley	13.8 (9.7 - 17.8)
United States	8.9 (8.7 - 9.0)

Data Source: KY BRFSS 2012

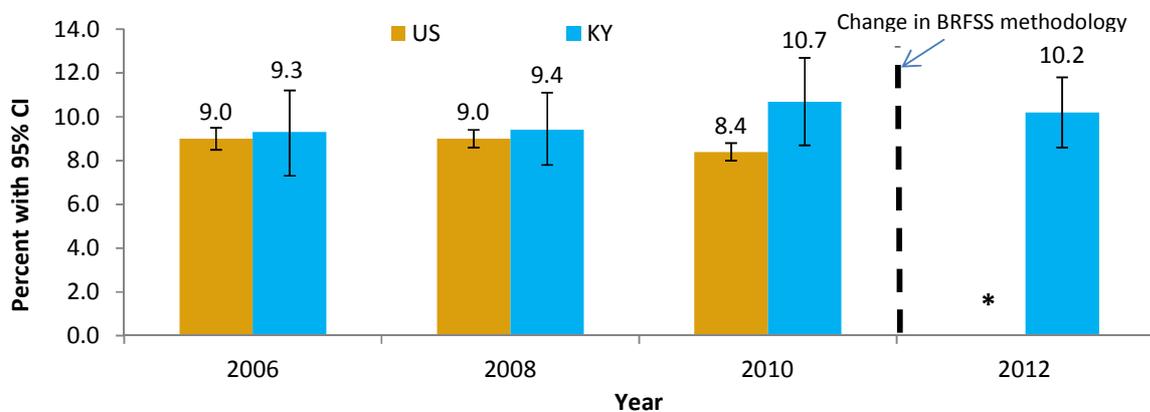
Child Prevalence (≤ 17 years old)

Asthma is one of the most common chronic disorders among children. Over 10 million U.S. children under 18 years of age have been diagnosed with asthma in their lifetime. In 2011, asthma affected an estimated 7.1 million children under 18 years of age.⁸

The BRFSS childhood asthma module was used to determine the prevalence of asthma in Kentucky children (see Appendix A).

Estimates of current asthma prevalence among children in Kentucky compared to children in the United States are displayed in Figure 6. In Kentucky, the estimated child current asthma prevalence in 2012 was 104,000 or 10.2% (95% CI, 8.6 – 11.8).

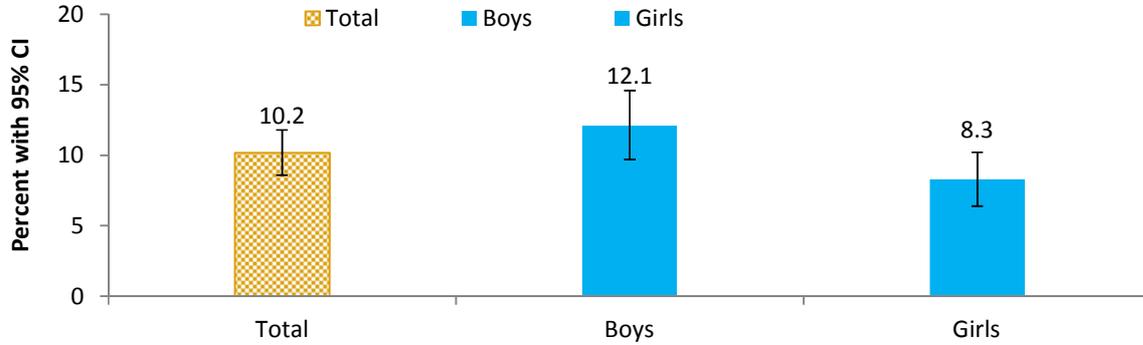
Figure 6: Current Asthma Prevalence Among Children, Kentucky and U.S. 2006-2012



Data source: KY BRFSS 2006, 2008, 2010 and 2012 and U.S. BRFSS 2006, 2008, 2010 and 2012. BRFSS 2010 data is not considered comparable to 2012 data. * U.S. 2012 data is not yet available.

In 2012, 12.1% of Kentucky boys (95% CI, 9.7 – 14.6) and 8.3% of Kentucky girls (95% CI, 6.4 – 10.2) had current asthma, but this difference is not statistically significant (Figure 7).

Figure 7: Current Asthma Prevalence Among Children by Gender, Kentucky 2012



Data source: KY BRFSS 2012

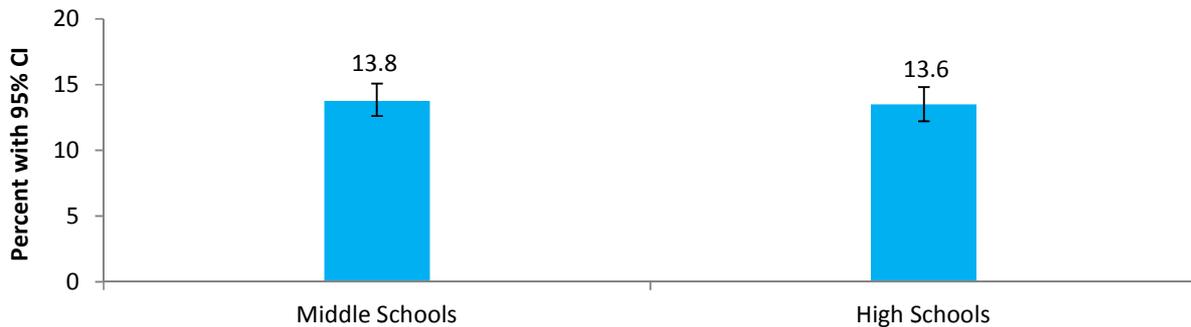
Current Asthma Prevalence in Middle and High School Students

The Kentucky Youth Tobacco Survey (KYTS), a survey used to measure awareness, attitudes and behaviors related to tobacco use and other issues in public middle and high school students, includes questions about asthma prevalence. (Appendix A.)

The KYTS is coordinated by the CDC and administered by the KDPH Tobacco Prevention and Cessation Program. The KYTS administered in 2010 included three asthma questions. Results presented here are only from students who responded to current asthma prevalence.

Approximately 13.8% of middle school students and 13.6% of high school students reported current asthma in 2010 (Figure 8).

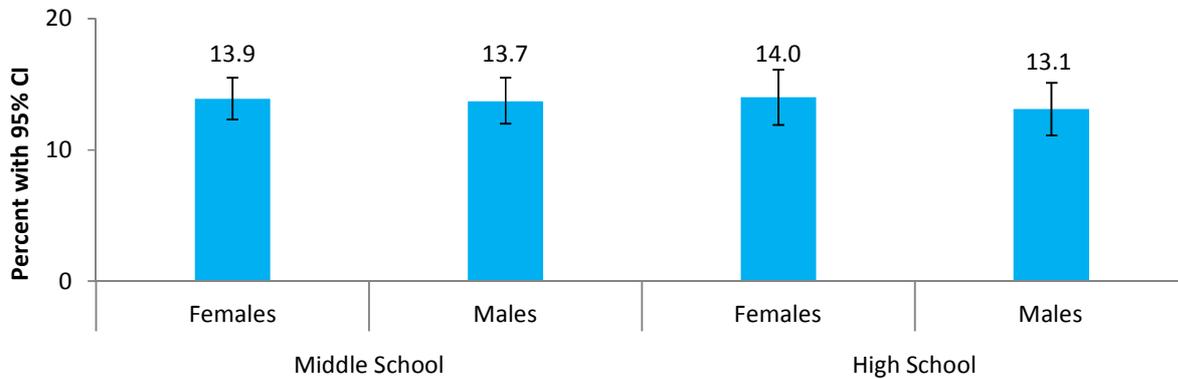
Figure 8: Current Asthma Prevalence Among Public Middle and High School students, Kentucky 2010



Data source: 2010 KYTS

In 2010, current asthma prevalence is statistically the same for males and females in both middle school and high school students (Figure 9).

Figure 9: Current Asthma Prevalence Among Public Middle and High School students by School and Gender, Kentucky 2010



Data source: 2010 KYTS

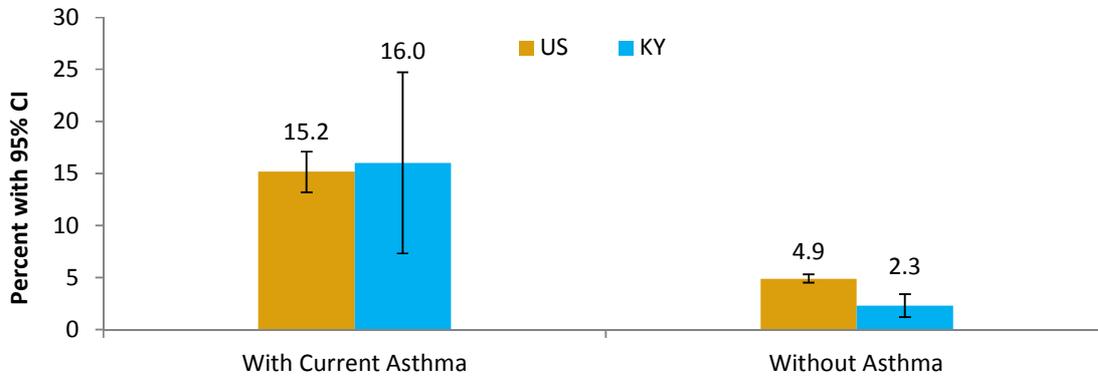
Missed School Days in Children With Asthma

The number of missed school days in children with asthma is assessed using data from the 2011-2012 National Survey of Children’s Health (NSCH) and the 2009-2010 National Survey of Children with Special Health Care Needs (NS-CSHCN). The NSCH is a national telephone survey that provides a broad range of information about children’s health and well-being, and NS-CSHCN is a national telephone survey that provides a broad range of information about the health of children with special needs. The latter survey includes information about conditions such as attention deficit disorder, depression, asthma, diabetes, etc. and functional status such as the ability to breathe or swallow, ability to provide self-care, learning ability, ability to understand, and ability to speak, etc. (Appendix A).

Note: Children with special health care needs are those who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally.

Asthma is the leading cause of school absenteeism with 10.5 million school days missed each year in the United States.⁹ In Kentucky, children with asthma miss school at a much higher rate than those without asthma. Excessive school absenteeism disrupts the process of learning, affects academic performance and is a strong predictor of premature school dropout.¹⁰ According to the NSCH 2011-2012, 16.0% of Kentucky children with asthma missed 11 or more days of school compared to 2.3% among children without asthma. This compares to a U.S. rate of 15.2% of children with asthma with 11 or more school absences in the past year (Figure 10). Absenteeism also has a financial impact on schools. The Support Education Excellence in Kentucky (SEEK) program uses a formula-driven allocation system to provide funds to local school districts. The formula includes funding for transportation and special needs students as reported by districts. Using NSCH data, Kentucky schools lost an estimated \$10 million in SEEK funding in 2012-2013 due to missed schools days among those students with current asthma.

Figure 10: Children With or Without Asthma Having 11 or More Days of School Absences in the Past Year, Kentucky and U.S., NSCH, 2011-2012

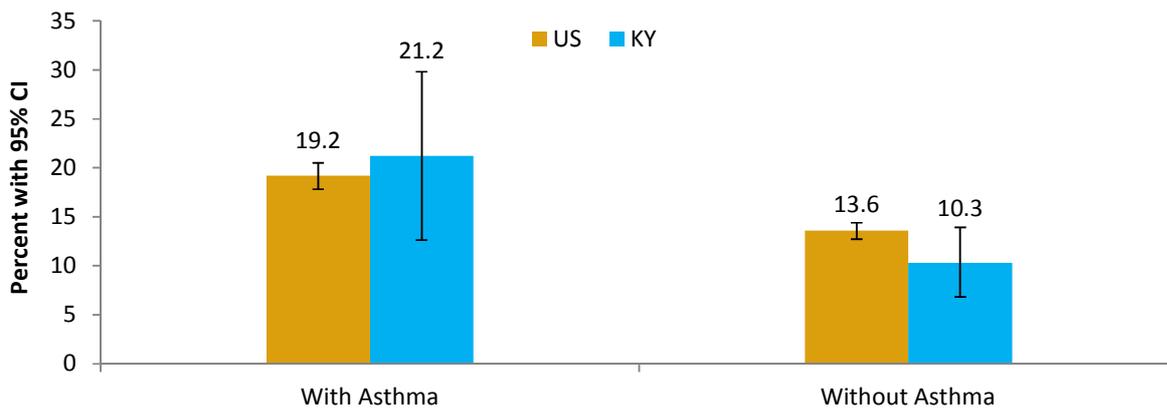


Data source: NSCH, 2011-12 for KY and U.S

Missed School Days Among Children With Special Health Care Needs (NS-CSHCN)

The NS-CSHCN assesses children’s health and functional status, including limitations experienced due to health conditions, and is considered the most current data available for children with special health care needs. According to the survey, 21.2% of Kentucky children with special needs missed 11 or more days of school in the past year due to asthma compared to 10.3% of students without asthma (Figure 11).

Figure 11: Special Needs Children With or Without Asthma Missing 11 or More Days of School in the Past Year, Kentucky and U.S., NS-CSHCN, 2009 and 2010



Data source: NS-CSHCN, 2009-10 for KY and U.S.

CHAPTER 3: RISK FACTORS ASSOCIATED WITH ASTHMA

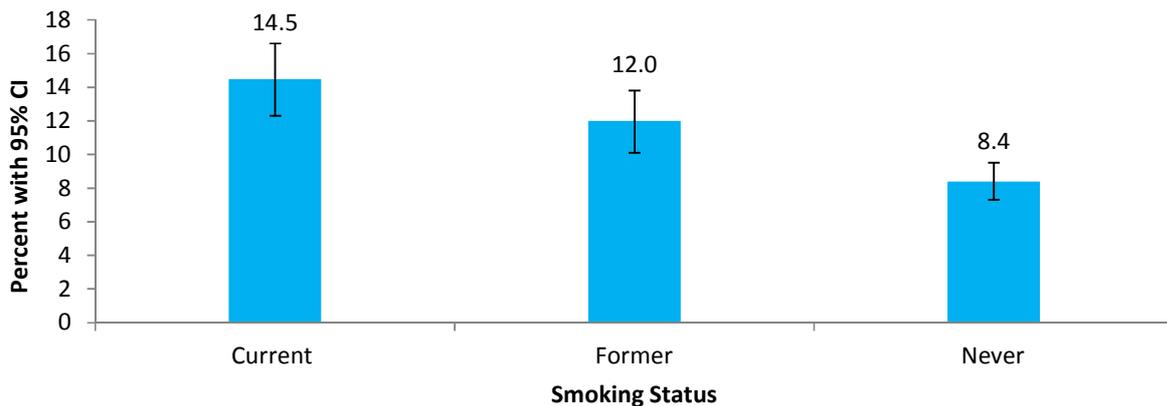
A risk factor is any attribute, behavior or exposure experienced by an individual that can increase the likelihood of developing the disease. While the exact causes of asthma are unknown, research shows that some genetic and environmental triggers interact to cause the disease, most often early in life.¹¹ However, asthma can develop at any age. Some of the triggers associated with either causing or worsening asthma include allergens (e.g. pollen, mold, dust mite or animal dander), indoor and outdoor pollutants, airway infections, both personal and secondhand tobacco smoke and other factors such as exercise, cold air or stress. Overweight and obese adults, especially females, are at a greater risk of developing asthma.¹² Socio-economic factors like lower levels of formal education and lower income are also associated with asthma.¹³

Smoking

Personal Smoking Status

According to the 2012 BRFSS, Kentucky has the highest smoking rate in the nation. Among Kentucky adults, current asthma prevalence is significantly higher among current smokers (14.5%) than among adults who have never smoked (8.4%) (Figure 12).

Figure 12: Current Asthma Prevalence Among Adults by Smoking Status, Kentucky 2012

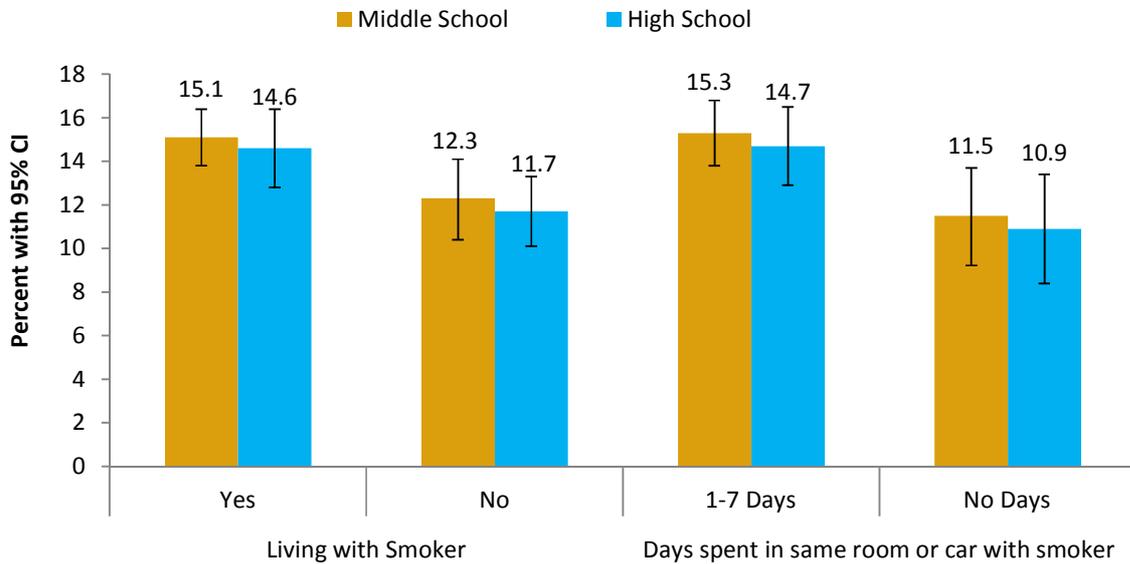


Data source: KY BRFSS, 2012

Exposure to Secondhand Tobacco Smoke

Exposure to secondhand tobacco smoke is associated with adverse asthma-related outcomes. In 2010, public middle and high school students living with a smoker reported higher current asthma prevalence than those who did not live with a smoker (Figure 14). This difference was statistically significant among high school students. Additionally, students who reported spending any time during the last seven days in the same room or car with a smoker had higher current asthma prevalence than those who reported spending no time in the last seven days in the same room or car with a smoker (Figure 13).

Figure 13: Current Asthma Prevalence Among Public Middle and High School Students by Exposure to Secondhand Tobacco Smoke, Kentucky 2010



Data source: KYTS, 2010

Indoor Environmental Trigger Exposures

Exposure to indoor environmental triggers can cause an asthma attack. Some of the potential indoor environmental triggers for asthma symptoms include household pets, mold, tobacco smoke and droppings or decaying body parts of pests such as cockroaches.

Carpets or rugs are asthma triggers as they tend to trap dust mites, pet dander, and other allergens. Kitchen appliances such as gas ranges and home heating sources such as woodstoves and fireplaces may emit harmful gases like nitrogen dioxide that can irritate the throat and eyes and may cause shortness of breath in people with asthma.

Adult exposure to indoor environmental triggers was assessed through the Adult Asthma Callback Survey (ACBS). ACBS is a follow-up survey conducted among BRFSS respondents who report ever being diagnosed with asthma (See Appendix A).

Among adults with current asthma, a high proportion were exposed to indoor environmental triggers such as carpets or rugs in the bedroom (65.5%), pets inside the home (59.1%), pets allowed in the bedroom (48.3%) and exposure to cigarette smoke in the last week (34.3%). Almost 20.8% of people with current asthma reported cooking with gas, and 19.7% reported using a fireplace or woodstove as a home heating source (Table 4).

Table 4: Prevalence of Environmental Triggers in Homes of Adults With Current Asthma, Kentucky 2011

Triggers	Adults % (95% CI)
Carpets or rugs in bedroom	65.5 (55.9 - 75.1)
Pets inside home	59.1 (49.0 - 69.2)
Pets allowed in bedroom	48.3 (38.0 - 58.5)
Smoker at home in the last week	34.3 (24.8 - 43.8)
Cooks with gas	20.8 (12.7 - 28.9)
Uses fireplace or woodstove	19.7 (11.5 - 27.9)
Saw mice or rats in home	10.6 (5.8 - 15.4)
Mold inside home	8.2 (1.7 - 14.9)
Saw cockroach in home	5.8 (2.9 - 8.7)

Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Table 5 demonstrates evidence that many Kentuckians with asthma do not make environmental modifications to their homes to decrease exposure to indoor asthma triggers. For example, among adults with current asthma, only 28.0% used a pillow cover for controlling dust mites, 30.7% used a mattress cover for controlling dust mites, and 33.5% washed their sheets or pillow cases in hot water to decrease exposure to asthma triggers. The cost varies for each of these interventions which could be a deterrent in some cases.

Table 5: Prevalence of Environmental Modifications in the Homes of Adults with Current Asthma, Kentucky 2011

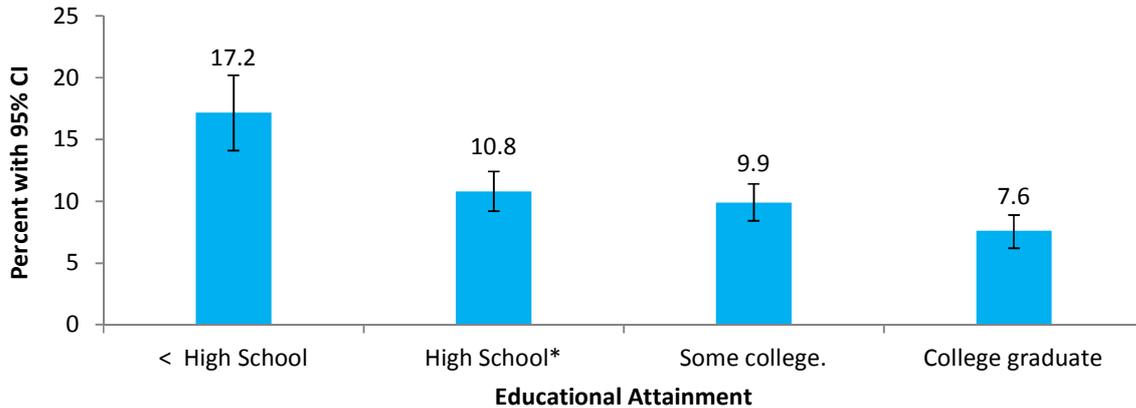
Modification	Adults % (95% CI)
Uses dehumidifier	16.8 (10.2-23.4)
Use air cleaner or air purifier	27.2 (19.6-34.8)
Uses pillow cover for controlling dust mites	28.0 (19.1-36.9)
Uses mattress cover for controlling dust mites	30.7 (21.4-40.0)
Washes sheets/pillowcases in hot water	33.5 (24.9-42.1)
Uses bathroom exhaust fan	67.7 (58.7-76.6)
Uses kitchen exhaust fan	69.3 (59.6-79.0)

Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Low Educational Attainment

Kentucky adults with lower levels of formal education reported more than twice the rate of current asthma (17.2%), compared to adults with a college degree (7.6%) (Figure 14). Low levels of education may contribute to a lack of understanding about asthma and its treatment.

Figure 14: Current Asthma Prevalence by Educational Attainment, Kentucky 2012



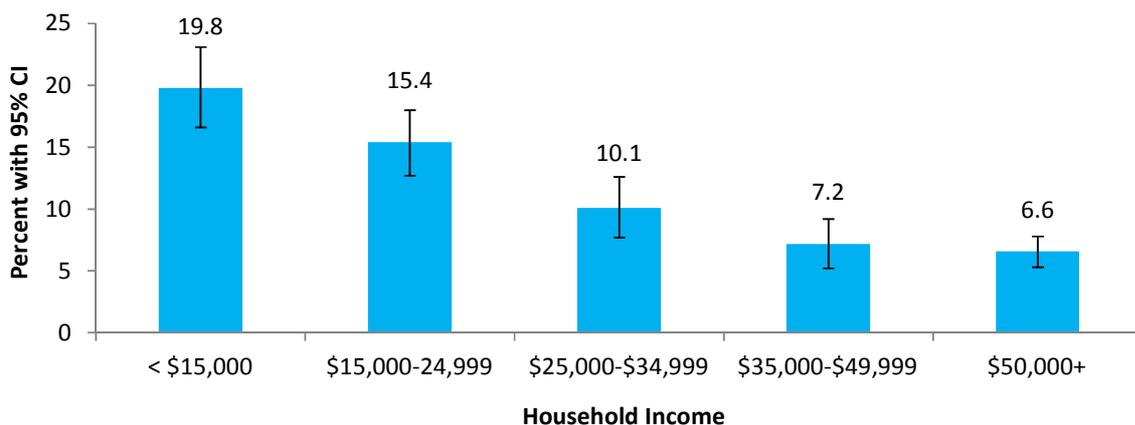
Data source: KY BRFSS, 2012.

*Or General Educational Development (GED)

Poverty

Figure 15 shows that asthma prevalence is three times higher among those with lower levels of income compared to those with the highest income. Poverty may cause increased exposure to asthma triggers due to substandard housing conditions and may prohibit asthma patients from mitigating these exposures.

Figure 15: Current Asthma Prevalence Among Adults by Annual Household Income, Kentucky 2012



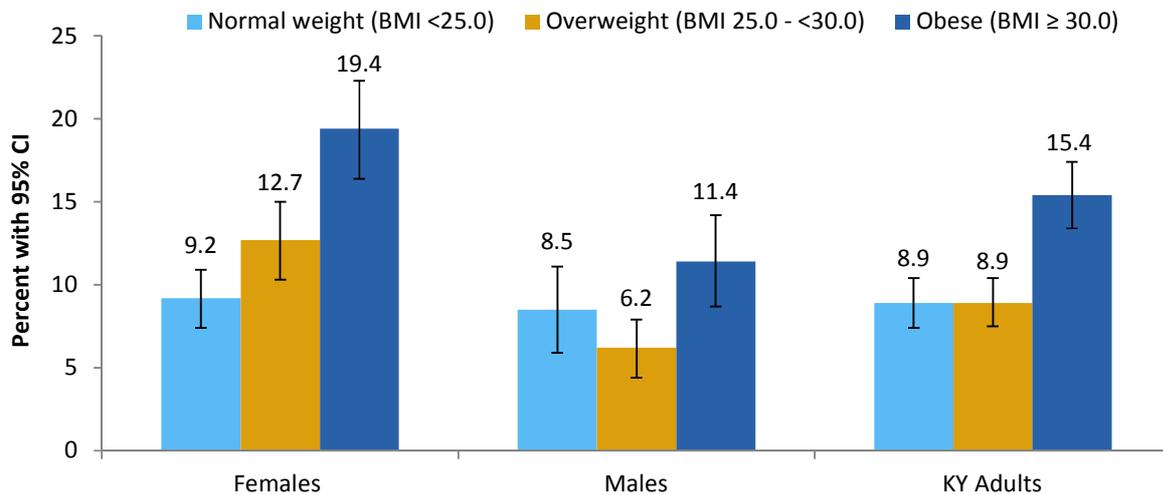
Data Source: KY BRFSS, 2012

Obesity

Emerging evidence shows that obese and overweight individuals, especially females, have a higher prevalence of asthma.¹⁴ Obesity is measured using Body Mass Index (BMI). In Kentucky, obese adults had a current asthma prevalence of 15.4%, while normal weight adults had a prevalence of 8.9% (Figure 16).

When stratified by gender, females had a stronger association between body weight and asthma prevalence. A higher percent of obese females (BMI \geq 30.0) reported having current asthma (19.4%), compared to 9.2% of normal weight females (BMI <25.0). Among obese and overweight adults, women reported higher current asthma prevalence than males (19.4% vs. 11.4% among obese individuals and 12.7% vs. 6.2% among overweight individuals.) These differences are statistically significant.

Figure 16: Current Asthma Prevalence Among Adults by Overweight/Obesity Status and Gender, Kentucky 2012



Data Source: KY BRFSS, 2012

CHAPTER 4: LIVING WITH ASTHMA

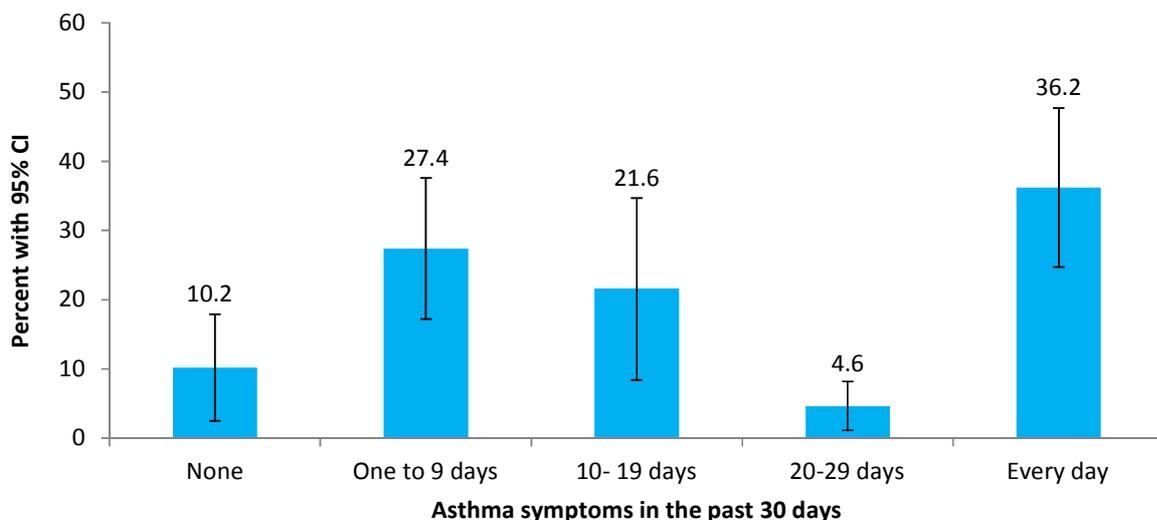
Patients living with asthma can have a better quality of life if they are able to manage their asthma and control their asthma symptoms. Quality of life is assessed by using a variety of indicators including the ability to carry out usual activities and the need to limit activities due to asthma. Asthma management includes receiving proper diagnosis and treatment by a medical professional as well as adequate self-management techniques.

The Adult Asthma Callback Survey (ACBS) of 2011, which is the most recent year for which this data is available, was used to evaluate several asthma management indicators including asthma symptoms, medication use, health care measures such as routine and urgent medical visits and flu shots, insurance coverage, quality of life, comorbid conditions and complementary and alternative methods of therapy, among others.

Asthma Symptoms

Among adults with current asthma, almost four in 10 (36.2%) reported experiencing asthma symptoms every day in the past 30 days (Figure 17).

Figure 17: Frequency of Asthma Symptoms in the Last 30 Days Among Adults With Current Asthma, Kentucky 2011

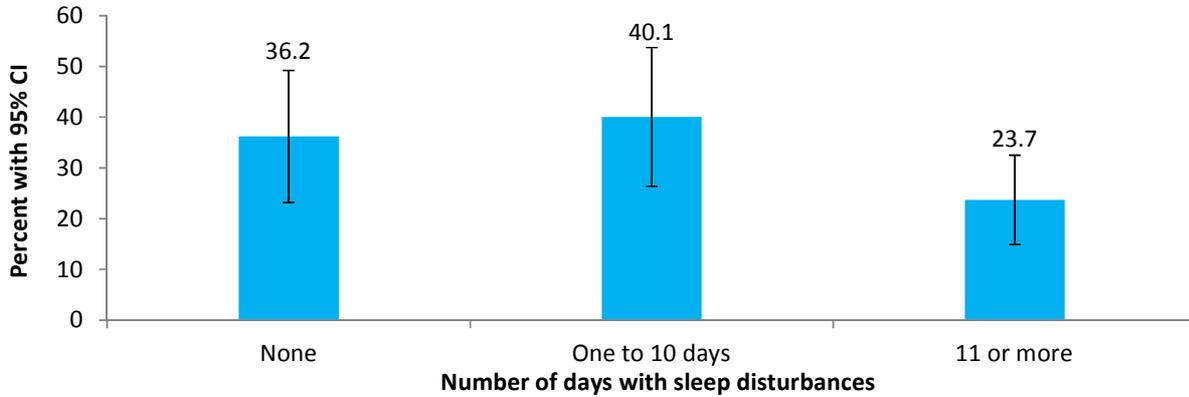


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Sleep Disruptions

The onset of symptoms at night can cause sleep disturbances that can affect the quality of life for individuals with asthma. Among adults with symptomatic current asthma, 63.8% reported their asthma symptoms made it difficult to sleep one or more nights, while 36.2% experienced no difficulty in sleeping during the past 30 days (Figure 18).

Figure 18: Frequency of Sleep Disturbances Due to Asthma in the Last 30 days Among Adults With Current Asthma, Kentucky 2011

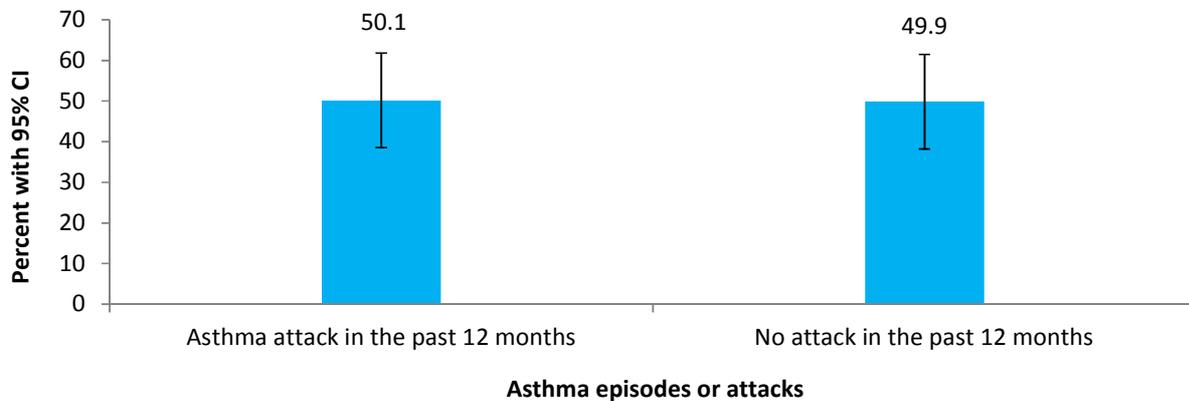


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Asthma Attacks

Asthma attacks are an indication of poor asthma control and may result in ED visits or hospitalizations. Five in 10 Kentucky adults (50.1%) with symptomatic current asthma had an asthma episode or attack within the past 12 months (Figure 19).

Figure 19: Asthma Episodes or Attacks in the Past 12 Months Among Adults With Current Asthma Symptoms, Kentucky 2011

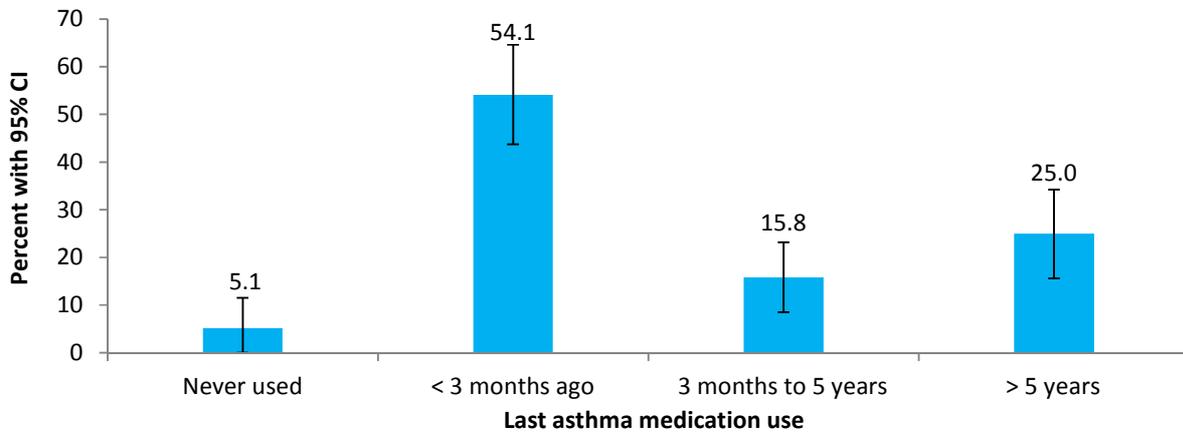


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Medication Use

According to the National Heart, Lung and Blood Institute (NHLBI), most people with asthma need to take long-term control medicines daily to help prevent symptoms. However, according to the 2011 Adult ACBS, only 286,200 (54.1%) Kentucky adults with asthma took asthma medication within the last three months (Figure 20).

Figure 20: Last Asthma Medication Use Among Adults With Current Asthma, Kentucky 2011

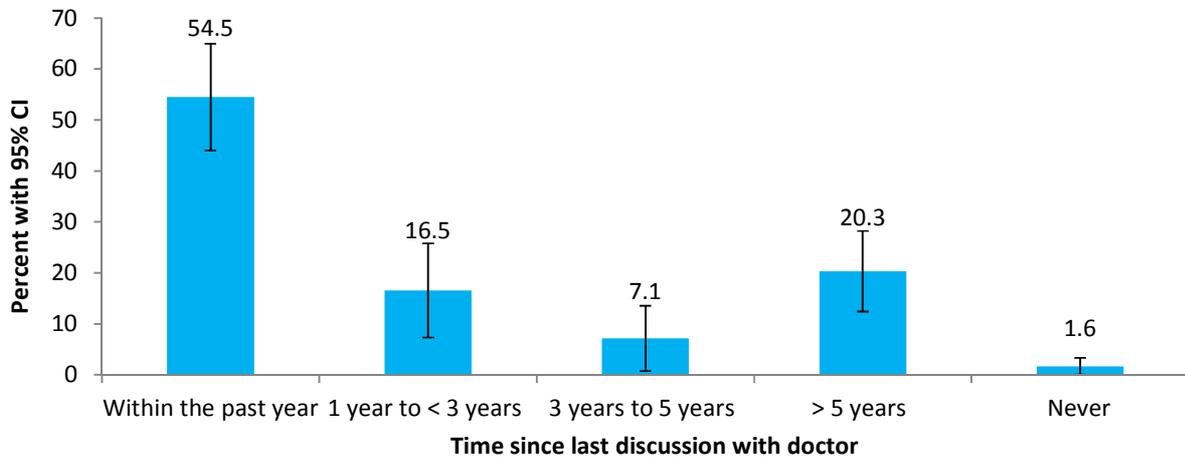


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Health Care Use

The NHLBI also recommends regular healthcare visits to properly manage asthma however data shows that many Kentuckians are not getting the care they need. An estimated 288,830 (54.5%) adults with asthma had talked to a doctor or other health care professional about their asthma within the past year (Figure 21).

Figure 21: Adults With Current Asthma Who Last Discussed Asthma With Their Doctor or Other Health Care Professional, Kentucky 2011



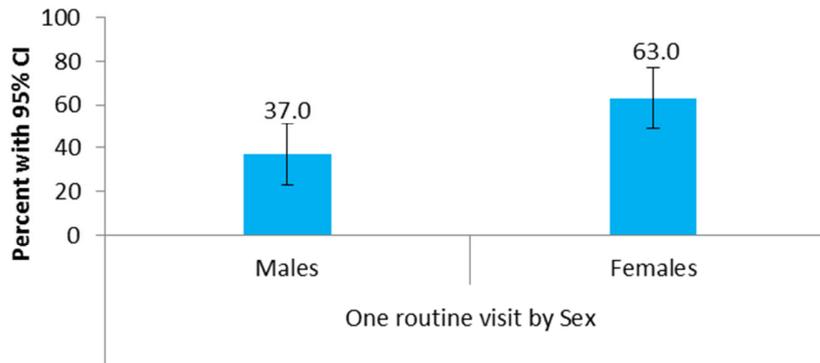
Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Routine Visits

Routine health care visits with a doctor or other health care provider are an important component of asthma management. The National Asthma Education and Prevention Program (NAEPP) Expert Panel Review-3 (EPR-3) guidelines recommend that routine visits be scheduled every one to six months, depending on the severity of asthma and the patient’s ability to maintain control of symptoms. Respondents with current asthma who indicated they saw a doctor for asthma within the past year were asked, “During the past 12 months how many times did you see a doctor or

other health professional for a routine checkup for your asthma?" Overall, 44.2% of adults with asthma reported one routine asthma visit in the past year. Females (63%) reported at least one routine healthcare asthma visit in the past 12 months. Only 37% of males with asthma reported a routine visit in the past 12 months. (Figure 22).

Figure 22: Routine Health Care Asthma Visits in the Past 12 Months Among Adults With Current Asthma by Gender, Kentucky 2011

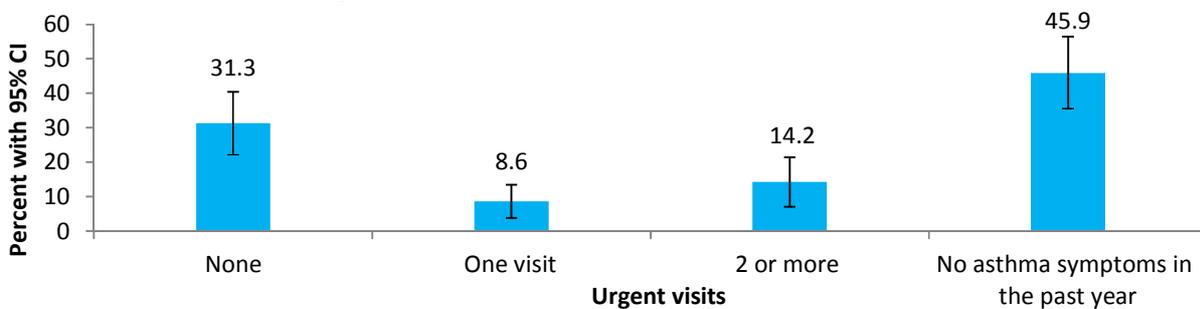


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Urgent Visits

When asthma is not well controlled, a person may have symptoms that cannot wait for a routine medical appointment. When adults with current asthma were asked how many times in the past 12 months they saw a health professional for urgent treatment of worsening asthma symptoms or for an asthma attack, 8.6% reported one urgent visit and 14.2% reported two or more (Figure 23).

Figure 23: Asthma-Related Urgent Visits Among Adults With Current Asthma During the Past 12 Months, Kentucky 2011

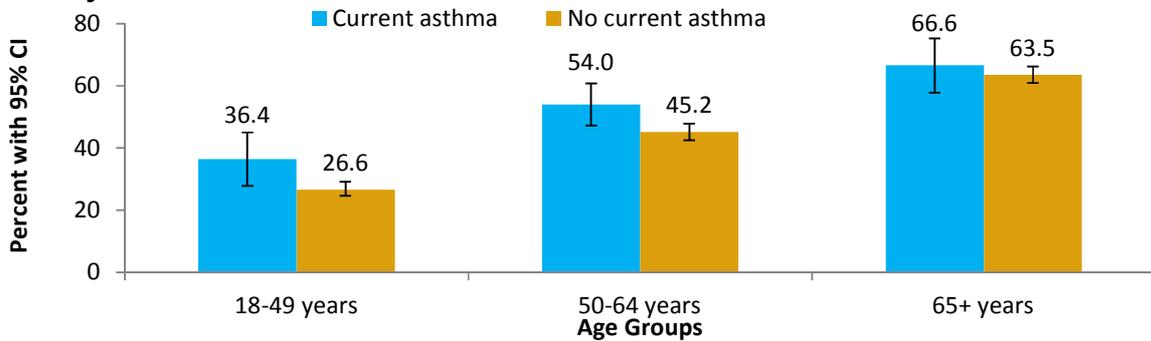


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Influenza Shots (Flu shots)

Patients with asthma are more likely to develop serious complications such as pneumonia if they contract the flu virus. To prevent these complications, EPR-III Guidelines recommend that all people with asthma receive a flu vaccination each year. Kentucky 2011 BRFSS data showed that adults with current asthma reported more seasonal flu shots than those without current asthma, however this difference is not statistically significant. In 2011, the prevalence of flu vaccination was 36.4% among those 18-49 years old, 54.0% among those 50-64 years old and 66.6% among those 65 years and older (Figure 24).

Figure 24: Flu Vaccination Among Adults With and Without Current Asthma by Age Group, Kentucky 2011



Data source: KY BRFSS 2011

Cost of Care

The cost of medical care and medications can be a barrier to asthma control particularly for those without health insurance or with high deductibles. ACBS respondents were asked if cost was a barrier to seeing a primary care doctor, seeing a specialist for asthma care or buying medication for asthma. The survey showed that 18.9% of adults with current asthma reported not being able to see their primary care doctor for asthma at some point in the past year due to cost. Only 14.0% reported not being able to see a specialist for asthma due to cost, however 30.1% reported not being able to afford asthma medications at some point in the last year (Table 6).

Table 6: Cost as a Barrier Among Adults With Current Asthma, Kentucky 2011

Measure	% (95% CI)
Cost was a barrier to seeing primary care doctor for asthma in the past year	18.9 (10.0 - 27.8)
Cost was a barrier to seeing specialist for asthma care in the past year	14.0 (5.4 - 22.6)
Cost was a barrier to buying medication for asthma in the past year	30.1 (19.3 - 40.9)

Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Insurance Coverage

ACBS respondents were asked two questions about their insurance coverage: “Do you have any kind of health care coverage including health insurance, prepaid plans such as HMOs, or government plans such as Medicare or Medicaid?” and “Was there any time you did not have health insurance or coverage during the past year?” Among adults with current asthma, 21.0% responded they were uninsured, 75.5% were insured with no gap in insurance coverage while 3.5% were insured but stated they had a gap in coverage at some point in the past year (Figure 25).

Figure 25: Percentage of Insurance Status and Coverage Gap in the Past 12 Months Among Adults With Current Asthma, Kentucky 2011

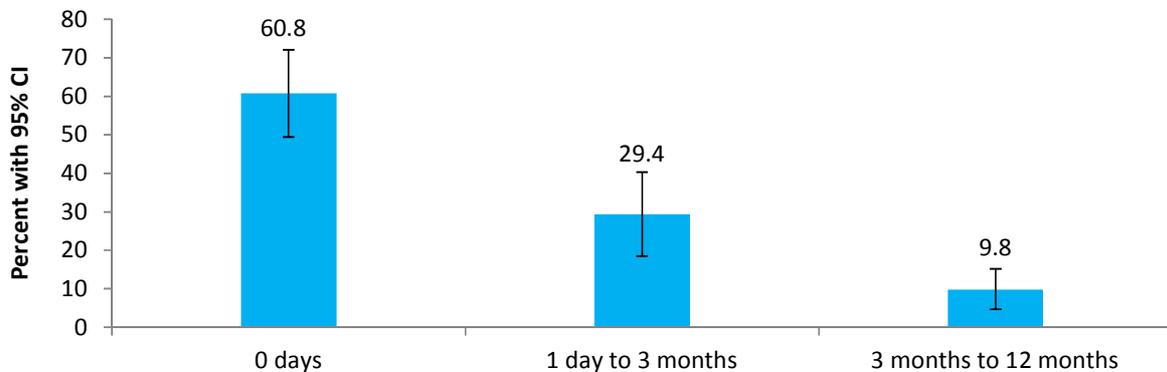


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Lost Productivity

Patients with poorly controlled asthma may miss days of work, be less productive in their work and may have to limit other daily activities. About four in 10 adults reported they were unable to work or carry out their usual activities because of asthma during the past 12 months. Of these, 29.4% were unable to carry out usual activities for at least one day and up to 3 months, and 9.8% were unable to carry out their usual activities for between 3 months and 12 months (Figure 26).

Figure 26: Adults With Current Asthma Unable to Work or Carry Out Usual Activities Due to Their Asthma, Kentucky 2011

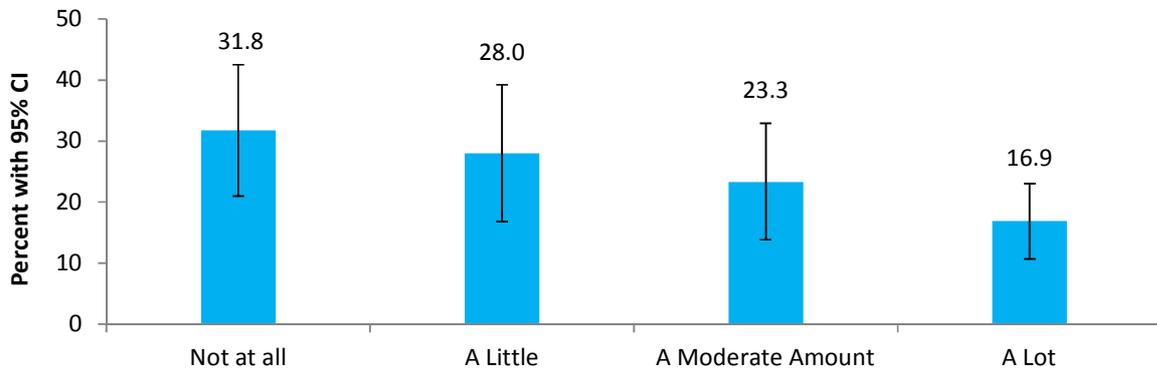


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Activity Limitation

In addition to reporting the number of days they were limited by asthma, respondents were asked about the extent to which they limited their usual activities due to asthma. Among adults with current asthma, 51.3% reported at least some limitation and 16.9% reported a lot of limitation to their usual activities because of their asthma (Figure 27).

Figure 27: Adults With Current Asthma Limiting the Amount of Usual Activities Due to Their Asthma During the Past Year, Kentucky 2011



Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Knowledge of Asthma and Asthma Self-Management

Having proper asthma education helps patients control their asthma. This knowledge includes the ability to self-manage asthma on a daily basis including being able to recognize early signs and symptoms and to use peak flow meters to adjust daily medications. The 2011 ACBS revealed some positive responses when assessing self-management knowledge among adults with current asthma. These results are detailed in Table 7.

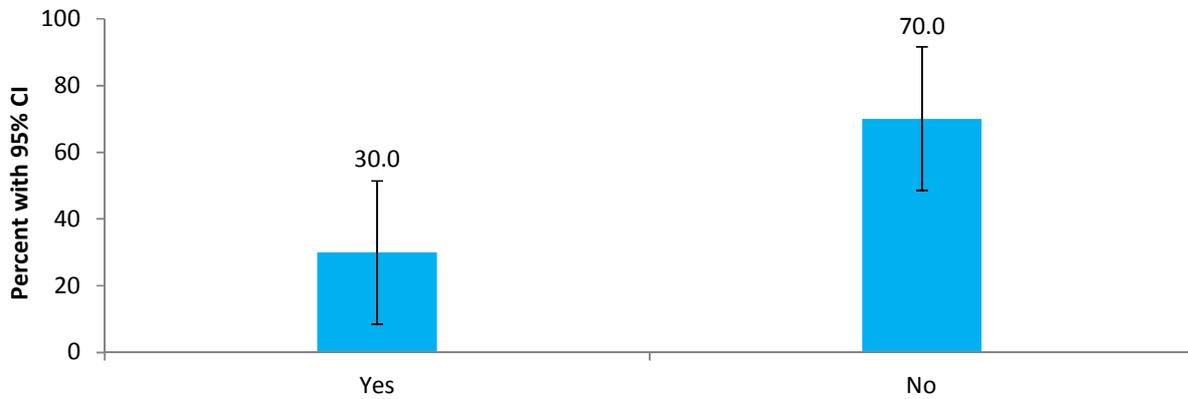
Table 7: Asthma Self-Management Knowledge Among Adults with Current Asthma, Kentucky 2011

Asthma Self-Management Knowledge	Adults % (95% CI)
Shown how to use inhaler by health professional	96.0 (93.8 - 98.2)
Health professional observed inhaler use	79.2 (72.0 - 86.4)
Taught what to do during an attack	72.3 (63.4 - 81.3)
Taught to recognize asthma signs/symptoms	67.3 (59.1 - 75.6)
Taught to use a peak flow meter	37.2 (27.5 - 47.0)
Given an asthma action plan	28.8 (19.1 - 38.5)
Took course on how to manage asthma	7.7 (3.2 - 12.3)

Data source: KY BRFSS Adult Asthma Call Back Survey 2011

The NAEPP recommends the use of a written asthma action plan as part of proper asthma management. Having an asthma action plan can help people better manage their asthma and avoid the need for an ED or urgent visit. Of the adults with current asthma who used an emergency department or urgent care center because of their asthma, only 30.0% recalled ever being given an asthma action plan by a doctor or other health professional (Figure 28).

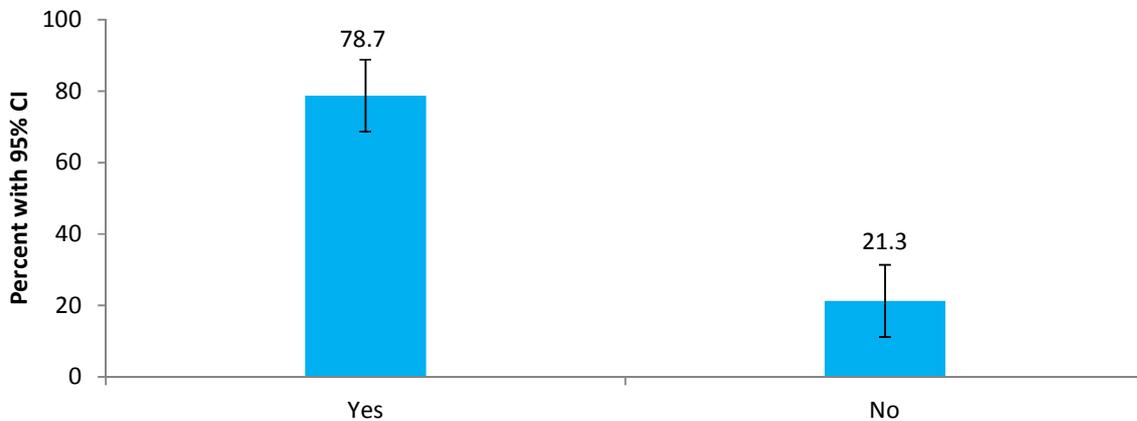
Figure 28: Adults Visiting an Emergency Department Ever Given an Asthma Action Plan, Kentucky 2011



Data source: KY BRFSS Adult Asthma Call Back Survey 2011

It is particularly important that those who have had a recent asthma attack are taught what to do during a future attack. Of the adults with current asthma who had an asthma episode or attack in the past 12 months, 78.7% were taught what to do during a future asthma episode or attack by a doctor or health professional (Figure 29).

Figure 29: Adults with Asthma Attack Ever Taught What to do During an Asthma Attack, Kentucky 2011



Data source: KY BRFSS Adult Asthma Call Back Survey 2011

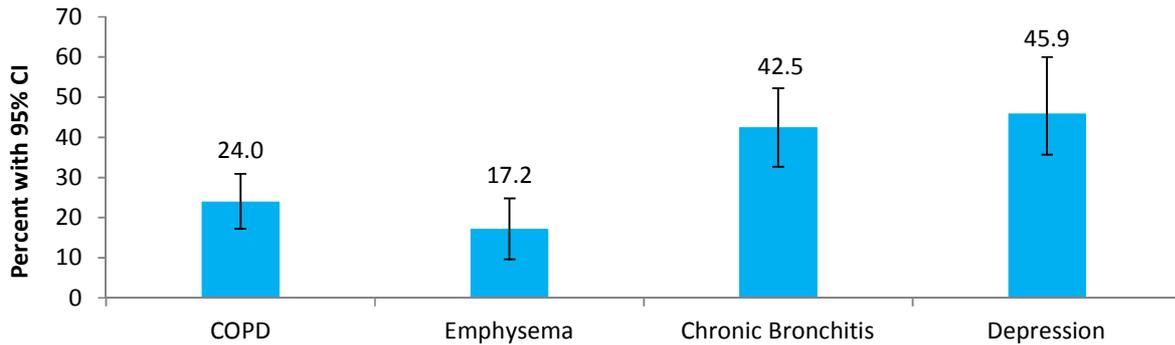
Comorbid Conditions

Comorbid conditions are an important consideration in asthma management. If these conditions are treated appropriately, asthma control may improve.

Also, some people with asthma may have other co-existing respiratory conditions, including chronic obstructive pulmonary disease, emphysema or chronic bronchitis, which may make asthma management more difficult or vice versa.

High rates of depression (45.9%) in adults with current asthma in Kentucky may be an indication that their asthma is not well controlled, or uncontrolled asthma may be leading to depression. Additional education to improve self-management and coping skills and linkage to appropriate resources may be helpful. Figure 30 details the prevalence of comorbid conditions among people with current asthma in Kentucky in 2011.

Figure 30: Adults With Current Asthma Having Comorbid Conditions Such as Chronic Obstructive Pulmonary Disease (COPD), Emphysema, Chronic Bronchitis, and Depression, Kentucky 2011

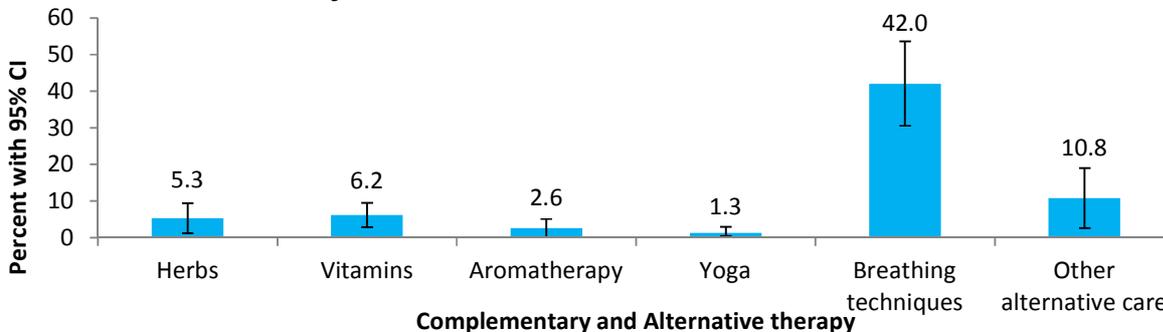


Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Complementary and Alternative Methods of Therapy

Sometimes individuals use complementary or alternative methods of therapy for asthma control. These can include the use of herbs, vitamins, acupuncture, acupressure, aromatherapy, homeopathy, reflexology, yoga, breathing techniques and naturopathy (Figure 31). While research continues, currently the National Institutes of Health National Center for Alternative and Complementary Medicine (NCACM) states there is not enough evidence to support the use of any complementary approaches for the management of asthma. NCACM also recommends that patients who are using any form of complementary therapy discuss it with their doctor and not use these methods of therapy to avoid or delay medical treatment of asthma.

Figure 31: Use of Complementary and Alternative Methods of Therapy Among Adults With Current Asthma, Kentucky 2011



Data source: KY BRFSS Adult Asthma Call Back Survey 2011

CHAPTER 5: WORK-RELATED ASTHMA

What is Work-Related Asthma?

Work-related asthma (WRA) is asthma caused or triggered by conditions or substances in the workplace. The two main types are work-exacerbated asthma (pre-existing or concurrent asthma that is made worse by conditions in the workplace) and occupational asthma (new onset asthma that is caused due to workplace exposures in a person who did not previously have asthma).^{15, 16} Approximately 15% of U.S. adults with asthma have asthma due to occupational exposures, according to an estimate from the American Thoracic Society.¹⁷ WRA is a preventable occupational respiratory disease. For a case of asthma to be recognized or reported as work-related, a doctor or healthcare professional must make a diagnosis of asthma that occurred after starting work at a particular location and make an association between asthma symptoms and possible workplace exposures.

What Causes Work-Related Asthma?

WRA can be triggered by chemicals, fumes, smoke, irritants or sensitizers in more than 350 substances.¹⁸ Some common asthma triggers in the workplace include wood dust, especially cedar, chemicals in polyurethane paints, isocyanates in spray-on truck bed liners, animals and insects, grain and flour dust, latex gloves and cleaning agents.¹⁹

Who Gets Work-Related Asthma?

Workers in many different jobs can get work-related asthma. Some common examples are healthcare providers, spray painters, janitors and cleaners, farm laborers and animal handlers.²⁰

Work-Related Asthma From Kentucky ACBS

The 2011 ACBS included questions to measure WRA among Kentucky adults with current asthma. The following questions were included:

- Was your asthma caused by chemicals, smoke, fumes or dust in your current job?
- Is your asthma made worse by chemicals, smoke, fumes or dust in your current job?
- Was your asthma caused by chemicals, smoke, fumes or dust in any previous job you ever had?
- Was your asthma made worse by chemicals, smoke, fumes or dust in any previous job you ever had?
- Were you ever told by a doctor or other medical person that your asthma was related to any job you ever had?
- Did you ever tell a doctor or other medical person that your asthma was related to any job you ever had?

Table 8 shows that among currently employed adults, 40.7% report their asthma was caused or made worse by their current job. Respectively, for adults who were ever employed, 43.8% report their asthma was caused or made worse by their previous job. Among adults who have ever been employed, 10.8% reported doctor-diagnosed WRA while this number increased to 15.5% for self-identified WRA.

Table 8: Proportion of Asthma Attributable to Work Among Adults With Current Asthma, Kentucky 2011

Proportion of Asthma Attributable to Work	% (95% CI)
Asthma was caused or made worse by current job among currently-employed adults	40.7 (20.9-60.4)
Asthma was caused or made worse by previous job among ever-employed adults	43.8 (32.9-54.5)
Ever-employed adults with doctor diagnosed work-related asthma	10.8 (6.0-15.5)
Ever-employed adults with self -identified work-related asthma	15.5 (7.5-23.6)

Data source: KY BRFSS Adult Asthma Call Back Survey 2011

Preventing and Managing Work-Related Asthma

Employers can take the following steps to prevent and help manage asthma in the workplace:

- Change work practices to remove or reduce exposures
- Provide proper ventilation
- Provide a properly fitted mask called a respirator
- Provide training on proper use of equipment and proper work practices
- Conduct medical monitoring to find workers' symptoms early

Employees can also make the workplace healthier by following these steps:

- Identify substances in your work area that cause or make your asthma worse
- Use a properly fitted mask when working around asthma-causing substances
- Move to a different work area if possible
- Don't smoke or, if you are a current smoker, take steps to stop smoking

CHAPTER 6: HEALTH CARE UTILIZATION

Asthma hospitalizations and ED visits are important measures of healthcare use by people with asthma, and important indicators of asthma morbidity. According to the CDC, asthma accounts for more than 15 million physician office and hospital outpatient department visits,²¹ and about 2 million ED visits each year.²²

Asthma costs the U.S. healthcare system an estimated \$56 billion annually in both direct healthcare expenditures and indirect costs from lost productivity.²³ Asthma is the third leading cause of hospitalization among children under the age of 5, and is associated with increased ED visits.²⁴ Researchers project asthma interventions among vulnerable populations save as much as 25% of total asthma costs.²⁵

The Kentucky Office of Health Policy (OHP) collects both inpatient hospital discharge and outpatient services data (which includes emergency department data) pursuant to 900 KAR 7:040. International Classification of Diseases 9th Revised Clinical Modification (ICD-9) codes 493.00-493.99 were utilized for identifying asthma as a primary diagnosis. Primary diagnosis refers to the first listed diagnosis for which the patient was hospitalized.

This chapter provides an analysis of statewide and county level data. All hospitalizations and ED visits are reported as events. Some people experience multiple hospital admissions or ED visits therefore, data presented in this chapter shows the number of hospitalizations or visits, not the number of individuals. All hospital and ED visit data were selected for analysis based on the discharge date.

Individuals who are not Kentucky residents are excluded from this analysis. Kentucky residents receiving out-of-state asthma care are also excluded, hence rates may reflect a slight underestimation of total asthma hospitalizations and ED visits among Kentucky residents. All rates presented in this chapter are based on asthma as the primary diagnosis. Hospitalization rates and ED visits are age-standardized to the U.S. 2000 standard population where noted.

Inpatient Hospitalizations

Asthma hospitalizations are an important surveillance measure as they help identify populations that are most in need of asthma interventions, asthma management efforts and preventive care. Asthma hospitalizations are serious and costly. The use of asthma self-management education may reduce hospitalization and improve quality of life.

An asthma hospitalization was defined as having a primary diagnosis with ICD-9-CM code 493. In 2012, there were 5,826 hospitalizations in Kentucky for which asthma was the primary diagnosis. The total length of stay, average length of stay, total hospitalization charges and average charge per hospitalization were calculated by gender, age group and race.

Asthma hospitalization rates were higher in females than in males, which is consistent with prevalence trends. Average length of stay was also higher in females than in males and consequently total hospital charges are twice as high in females as compared to males (Table 9).

Table 9: Number of Asthma* Hospitalizations, Total Length of Stay (LOS), Average Length of Stay (LOS), Total Hospitalization Charges, Average Charge per Hospitalization by Gender, Age Group and Race, Kentucky 2012

	Asthma Hospitalizations (Number of Events)	Total LOS (Number of Days)	Average LOS (Number of Days)	Total Hospitalization Charges	Average Charge per Hospitalization
Gender					
Female	3,739	13,884	3.71	\$57,740,582	\$15,443
Male	2,087	6,364	3.05	\$28,317,564	\$13,568
Age group (years)					
0-4	948	2,227	2.35	\$9,517,608	\$10,039
5-17	848	2,204	2.60	\$10,737,323	\$12,661
18-34	590	1,494	2.92	\$6,220,210	\$12,148
35-64	2,255	8,442	3.74	\$36,623,439	\$16,241
65+	1,263	5,881	4.66	\$22,959,565	\$18,178
Race					
Black	1,067	3,467	3.25	\$17,556,353	\$16,454
White	4,674	16,559	3.54	\$66,984,964	\$14,331
Other**	88	222	2.52	\$1,516,830	\$17,236
Total Kentucky Population	5,826	20,248	3.48	\$86,058,147	\$14,771

*Asthma as primary diagnosis (ICD-9-CM 493)

** "Other" race categories include American Indian or Alaska Native, Native Hawaiian or Pacific Islander and Asian

Data source: Kentucky Hospital Discharge Data, Office of Health Policy

Data from the Office of Health Policy show that asthma is the third ranking cause of hospitalizations in children less than 18 years of age in Kentucky (Table 10).

Table 10: Top Three Causes of Hospitalization in Children Less Than 18 Years of Age, Kentucky 2010-2012

Cause of Hospitalization	Number of Hospitalizations in children <18 years		
	2010	2011	2012
Neonate with other significant problems	8658	8190	8785
Psychoses	4837	5453	5984
Bronchitis and asthma without CC* MCC**	3671	3731	3435

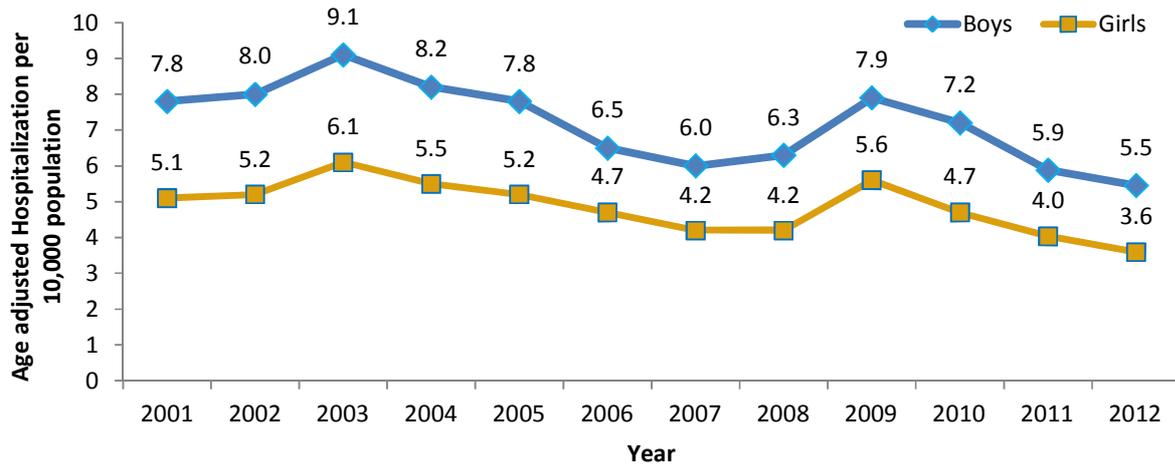
* CC=Complications and Comorbidities;

** MCC= Major Complications and Comorbidities

Data Source: Kentucky Office of Health Policy

The age-adjusted asthma hospitalization rates in both boys and girls have gradually declined in Kentucky. Among children less than 18 years of age, asthma hospitalizations are higher in boys than in girls (Figure 32). This trend reverses in adults where asthma hospitalizations are higher in females than in males (Figure 33). This is consistent with prevalence trends as asthma prevalence is higher in males before the age of 18 years and higher in females after the age of 18 years.

Figure 32: Age-Adjusted* Trends of Inpatient Hospitalization With Asthma Among Children 0-17 Years by Gender, Kentucky 2001-2012**

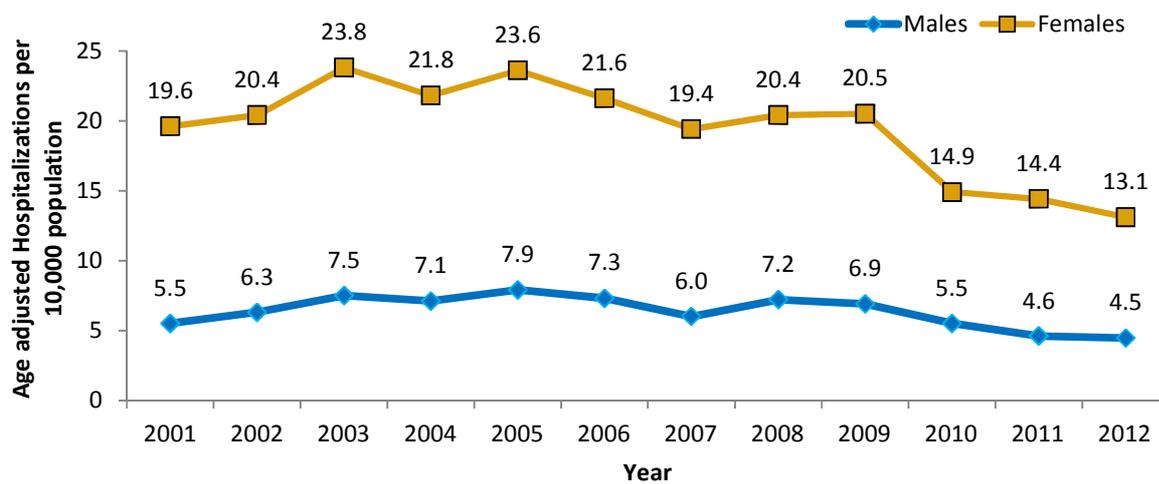


*Age-adjusted to the year 2000 U.S. standard population

**Asthma listed as the primary diagnosis (ICD-9-CM code 493)

Data source: Kentucky Hospital Discharge Data, Office of Health Policy, 2001-2012

Figure 33: Age-Adjusted* Trends of Inpatient Hospitalization With Asthma Among Adults by Gender, Kentucky 2001-2012**



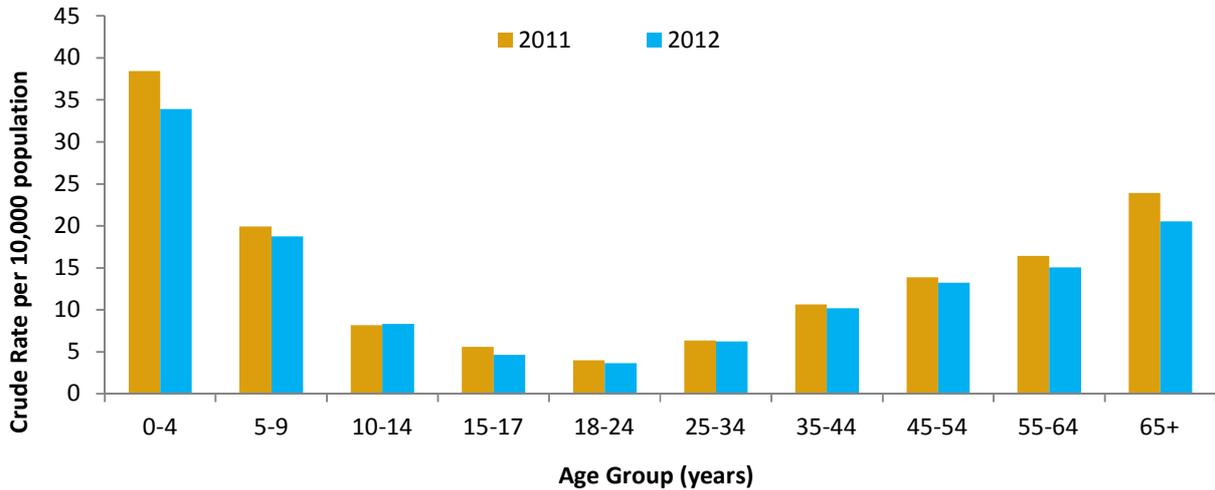
*Age-adjusted to the year 2000 U.S. standard population

**Asthma listed as the primary diagnosis (ICD-9-CM code 493)

Data source: Kentucky Hospital Discharge Data, Office of Health Policy, 2001-2012

In Kentucky, the crude rate of asthma hospitalizations by age group has been highest in the 0-4 year age group. Asthma hospitalizations among children aged 0-4 years have declined from 38.4 per 10,000 population in 2011 to 33.9 per 10,000 population in 2012. Asthma hospitalizations were lowest among people in the 18-24 year age group (3.7 per 10,000 population in 2012) and then increased with age (Figure 34).

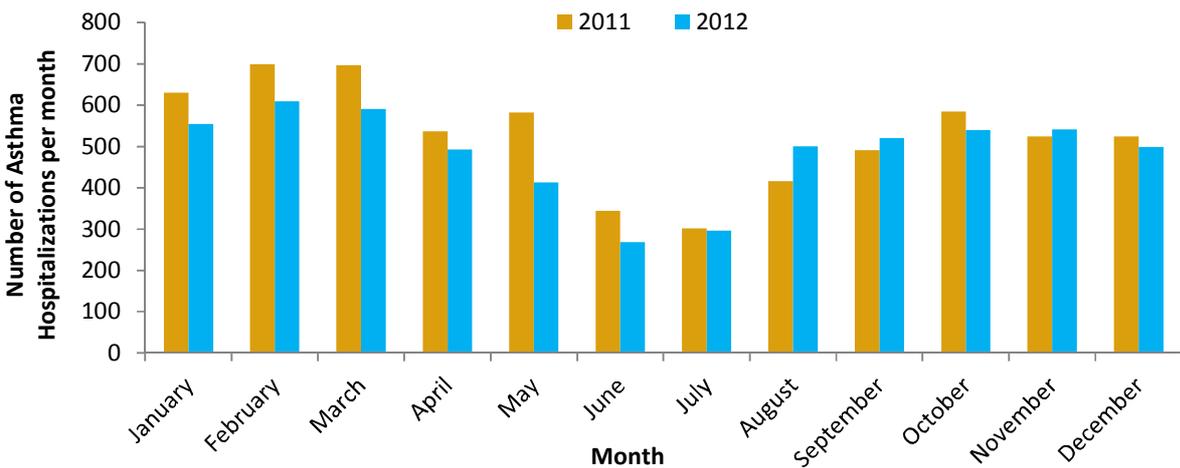
Figure 34: Asthma* Hospitalization Rate by Age Group, Kentucky 2011-2012



*Asthma listed as the primary discharge diagnosis (ICD-9 CM code 493)
 Data source: Kentucky Hospital Discharge Data, Office of Health Policy, 2011-2012

Asthma hospitalizations in 2012 were highest during the winter months and in early spring which may coincide with flu season (Figure 35).

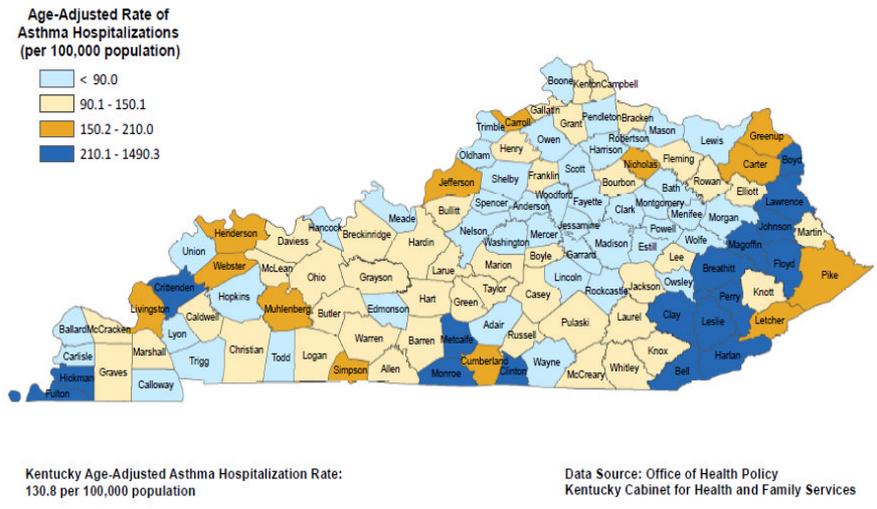
Figure 35: Number of Asthma* Hospitalizations by Month of Admission, Kentucky 2011-2012



*Asthma listed as the primary discharge diagnosis (ICD-9 CM code 493)
 Data source: Kentucky Hospital Discharge Data, Office of Health Policy, 2011-2012

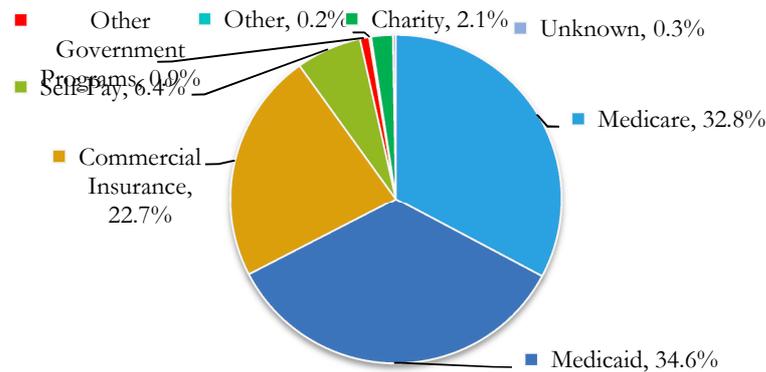
In Kentucky, the age adjusted asthma hospitalization rate for 2012 was 130.8 per 100,000 population. The most current U.S. age-adjusted asthma hospitalization rate was approximately 154.0 per 100,000 population in 2009. Map 3 shows county level age-adjusted asthma hospitalizations for 2012 in Kentucky. The lower asthma hospitalization rates in some counties may not reflect the true burden of asthma hospitalizations as some Kentucky residents may be admitted to out-of state hospitals just across the border.

Map 3: Age-adjusted Asthma Inpatient Hospitalization Rates by County, Kentucky 2012



The total direct charges associated with hospitalizations with asthma as the primary diagnosis were \$86 million in 2012 (Table 9). The most frequent primary payor for these charges was Medicaid (Figure 36). Medicare and Medicaid were the primary payors for nearly 68% of asthma hospitalizations.

Figure 36: Distribution of the Primary Payor for Asthma* Hospitalizations, Kentucky 2012



*Asthma listed as primary diagnosis (ICD-9-CM code 493)
Data source: Kentucky Hospital Discharge Data, Office of Health Policy

Emergency Department Visits

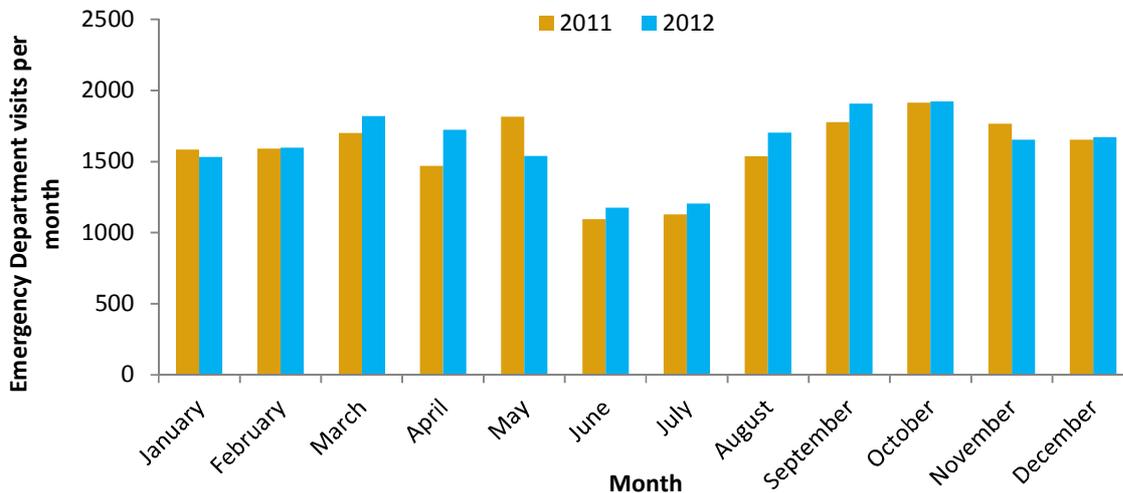
Asthma is one of the leading causes of ED visits, with approximately 1.8 million visits in the United States in 2010.²⁶

ED visits for asthma are an important surveillance measure as visiting the ED for asthma is a key indicator of poorly controlled disease and risk for future asthma exacerbations.

Prevention and intervention efforts can be directed toward these populations through the ED itself or through routine healthcare visits that provide patient education. During these visits in a physician's office or in the ED, a healthcare provider can assess proper inhaler use, discuss proper medication use, trigger recognition and steps to follow for worsening symptoms.

In 2011 and 2012, the number of ED visits for asthma was highest in early fall and in early spring (Figure 37). This corresponds with spring and fall allergy seasons in Kentucky.

Figure 37: Number of Asthma* Emergency Department Visits by Month, Kentucky 2011-2012



*Asthma as primary diagnosis (ICD-9-CM 493)
Data source: Kentucky Hospital Discharge Data, Office of Health Policy

In 2012, there were 19,455 ED visits among Kentucky residents for which asthma was the primary diagnosis (Table 11).

Kentucky females had more ED visits than males. The ED visit rate was also high for those in the 0-4 year age group.

The total charges for ED visits were over \$35 million, with an average charge of \$1,842 for an asthma-related visit. Medicaid charges represent almost over \$14 million of all ED visits. Contractual payments are less than charges. Self-pay (uninsured) ranked third in total charges for asthma ED visits in 2012 (Table 11).

Table 11: Number of Asthma* Emergency Department (ED) Visits, Total Asthma ED Visit Charges Average Charge Per Asthma ED Visit by Gender, Age, Race and Primary Payor, Kentucky 2012

Categories	2012		
	ED Visits (n)	Total Charges (\$)	Average Charge per visit (\$)
Gender			
Female	10,518	\$20,587,296	\$1,957
Male	8,937	\$15,240,312	\$1,705
Age Group (in years)			
0-4	3,173	\$5,090,666	\$1,604
5-17	4,930	\$7,069,299	\$1,434
18-34	4,965	\$8,308,733	\$1,673
35-64	5,442	\$12,618,091	\$2,319
65+	945	\$2,740,820	\$2,900
Race			
Black	5,330	\$9,368,378	\$1,758
White	13,610	\$25,658,162	\$1,885
Other**	515	\$801,068.87	\$1,556
Primary Payor			
Medicare	2,006	\$5,386,410	\$2,685
Medicaid	8,141	\$13,725,431	\$1,686
Commercial Insurance	4,738	\$8,774,852	\$1,852
Self-Pay/Uninsured	3,413	\$5,439,604	\$1,594
Other Government Programs	233	\$344,026	\$1,477
**Other	33	\$109,654	\$3,323
Charity	812	\$1,839,590	\$2,266
Unknown	79	\$208,040	\$2,633
Total Kentucky Population	19,455	\$35,827,608.25	\$1,842

*Asthma as primary diagnosis (ICD-9-CM 493)

** "Other" race categories include American Indian or Alaska Native, Native Hawaiian or Pacific Islander and Asian

Data source: Kentucky Hospital Discharge Data, Office of Health Policy (OHP). Note: 2012 ED data is preliminary

CHAPTER 7: ASTHMA IN THE MEDICAID POPULATION

Medicaid is a health and long-term care coverage program that is jointly financed by states and the federal government. It was enacted in 1965 through amendments to the Social Security Act.

Federal law requires states to cover certain eligible groups including qualified parents, children, and pregnant women with low income, as well as older adults and people with disabilities with low income.

The Kentucky Department for Medicaid Services (DMS) oversees this program. Medicaid pays for provider visits, procedures, outpatient emergency care, inpatient hospitalizations, prescription drugs and long-term care. Some of this data was requested from DMS for analysis for this report.

There were approximately 900,000 Medicaid enrollees in Kentucky each year from 2008 to 2011 including children, adults and those considered dual-eligible, meaning they are eligible for both Medicaid and Medicare. Dual-eligible individuals and people age 65 years and over are not included in this report.

This chapter describes asthma-related healthcare utilization among the Medicaid population in Kentucky from 2008 to 2011.

Medicaid claims data from the fee-for-service (FFS) group was analyzed. Data from the Passport Health Plan, a Medicaid managed care organization that covered 16 Kentucky counties during 2008-2011, is excluded from this report.

Prevalence

Within the Kentucky Medicaid population, asthma prevalence estimates were calculated based on the technical specifications for an asthma-related standardized performance measure called Healthcare Effectiveness Data and Information Set (HEDIS) which was developed by the National Committee for Quality Assurance (NCQA).²⁷

The time period chosen for Kentucky Medicaid data used in this chapter was 12 months each year, beginning November 1, 2008 to October 31, 2011. The selection criteria included the number of continuous enrollees defined by no more than 45 days of coverage lapse.

Asthma Prevalence

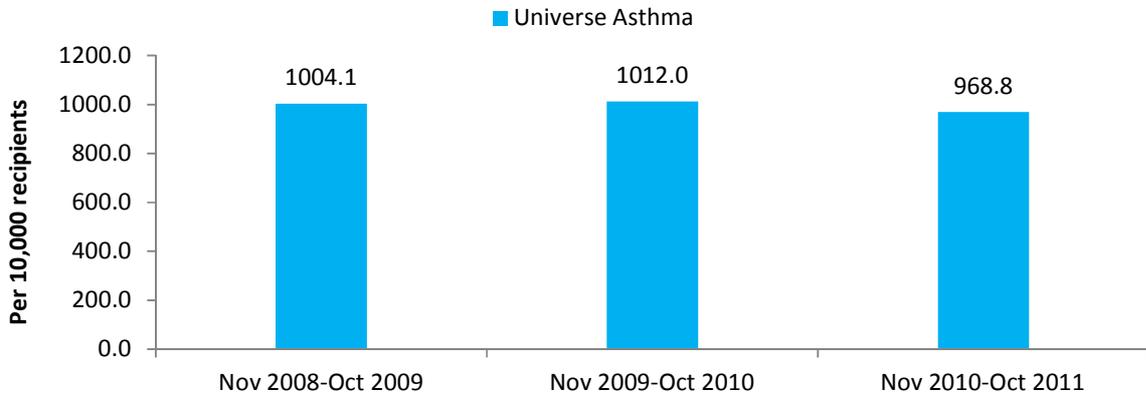
According to NCQA, a person is defined as being included in the asthma “universe” population if he or she meets at least one of the following criteria within a specified 12-month period:

- At least four prescriptions for asthma medication filled
- At least one ED visit with a primary diagnosis of asthma
- At least one hospital inpatient visit with a primary diagnosis of asthma
- At least one outpatient visit with asthma as the primary diagnosis

Asthma prevalence estimates among Kentucky Medicaid recipients in the “universe” asthma population were calculated in 12-month intervals from November 1 to October 31 each year from 2008 to 2011. Total Medicaid recipients increased over the three-year period.

Asthma prevalence in Medicaid FFS recipients under 65 years of age was stable in Kentucky between November 2008 and October 2011. Approximately one in 10 Medicaid recipients had “universe” asthma during this time period (Figure 38).

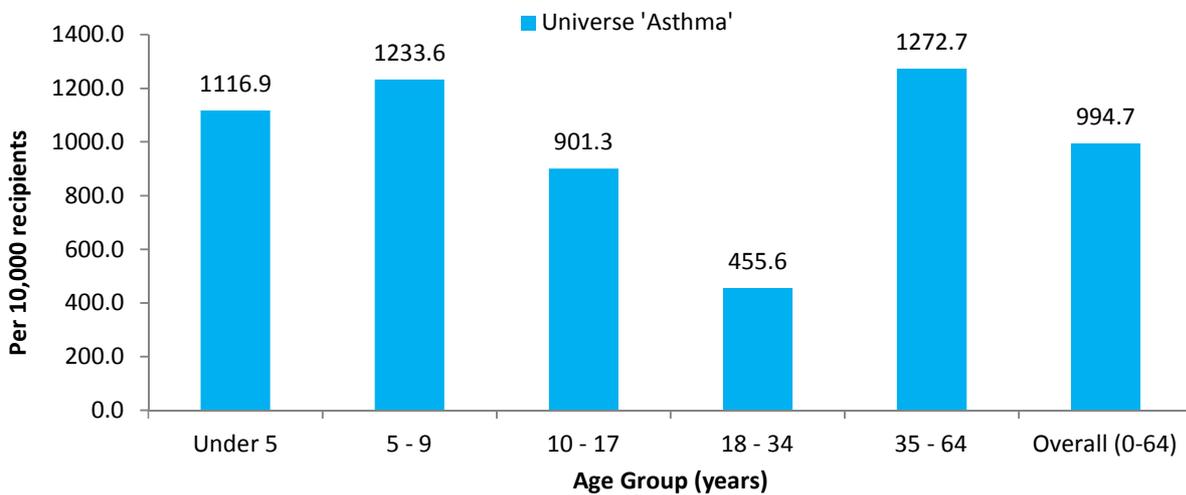
Figure 38: Medicaid Recipients with Asthma* by Year, Kentucky November 2008-October 2011



*Asthma defined by HEDIS criteria
 Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

Data from November 2008 to October 2011 shows that the highest asthma prevalence rate was in the 35-64 year age group (Figure 39).

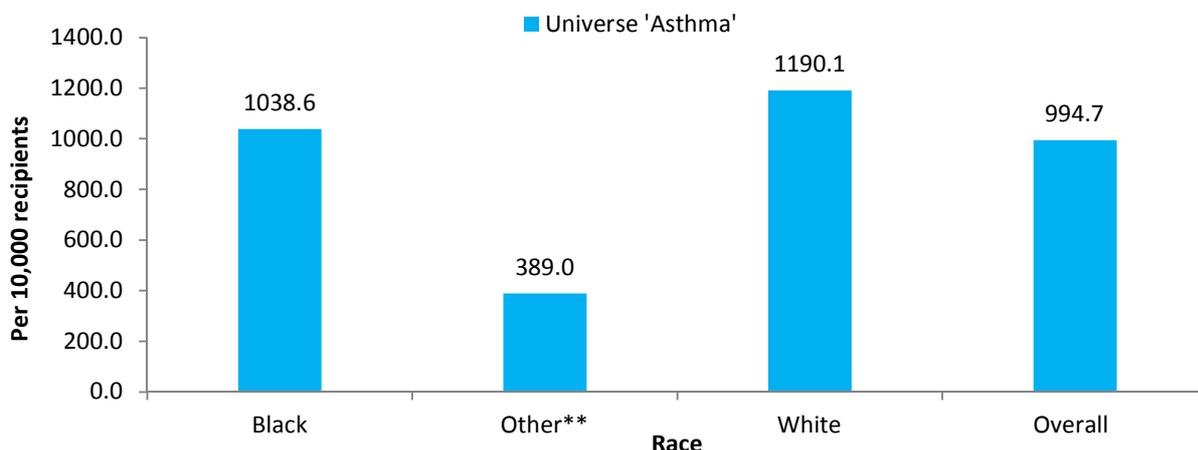
Figure 39: Medicaid Recipients with Asthma* by Age Group, Kentucky November 2008–October 2011



*Asthma defined by HEDIS criteria
 Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

When looking at data stratified by race during this same time period, the asthma prevalence rate was highest among whites. Among Medicaid recipients who listed their race as white, approximately one in 12 had asthma (Figure 40).

Figure 40: Medicaid Recipients With Asthma by Race, Kentucky November 2008-October 2011



*Asthma defined by universe asthma criteria

**"Other" race category includes Asian, American Indian, Other, Native Hawaiian and Missing

Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

Outpatient visits

Outpatient visits are health care visits that include services such as diagnosis, treatment and rehabilitation. Outpatient visits for asthma include both routine healthcare visits and urgent visits due to asthma exacerbations. The NAEPP guidelines recommend that routine visits be scheduled every one to six months depending on the severity of asthma and the patient's ability to maintain control of symptoms. For this analysis, an asthma outpatient visit was defined by ICD-9 code 493 (primary diagnosis only). Outpatient visits were highest for children under 18 (Table 12).

Table 12: Asthma* Outpatient Visits by Year and Age Group Among Medicaid Recipients, Kentucky November 2008-October 2011

Age Group	Nov 2008-Oct 2009	Nov 2009-Oct 2010	Nov 2010-Oct 2011
Under 5	26,725	28,435	24,247
5 - 17	53,762	63,167	61,634
18 - 34	9,306	9,599	9,025
35 - 64	30,097	30,736	29,733
Overall (0-64)	119,890	131,937	124,639

*Asthma listed as primary diagnosis

Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

Table 13 shows the number of outpatient visits by year and race among Medicaid recipients. The category of “other” includes missing data for race.

Table 13: Asthma* Outpatient Visits by Year and Race Among Medicaid Recipients, Kentucky, November 2008–October 2011

Race	Nov 2008-Oct 2009	Nov 2009-Oct 2010	Nov 2010-Oct 2011
Black	10,365	11,337	11,328
Other**	11,982	13,899	12,702
White	97,543	106,701	100,609
Overall	119,890	131,937	124,639

*Asthma listed as primary diagnosis

**“Other” race category includes Asian, American Indian, Other, Native Hawaiian and Missing data

Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

Emergency Department Visits

An asthma ED visit among Medicaid recipients was defined by ICD-9 code 493 as primary diagnosis. ED visits among Medicaid recipients decreased each year from November 2008 to October 2011. The 5-17 year age group had the highest number of ED visits each year (Table 14).

Table 14: Asthma* Emergency Department Visits by Year and Age Group Among Medicaid Recipients, Kentucky, November 2008-October 2011

Age Group	Nov 2008-Oct 2009	Nov 2009-Oct 2010	Nov 2010-Oct 2011
Under 5	1,500	1,408	1,349
5 - 17	2,046	2,126	2,053
18 - 34	944	981	883
35 - 64	967	817	837
Overall (0-64)	5,457	5,332	5,122

*Asthma listed as primary diagnosis

Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

Table 15 shows the number of asthma ED visits by year and race among Medicaid recipients.

Table 15: Asthma* Emergency Department Visits by Year and Race Among Medicaid Recipients, Kentucky, November 2008-October 2011

Race	Nov 2008-Oct 2009	Nov 2009-Oct 2010	Nov 2010-Oct 2011
Black	711	808	821
Other**	448	492	490
White	4,298	4,032	3,811
Overall	5,457	5,332	5,122

*Asthma listed as primary diagnosis

**“Other” race category includes Asian, American Indian, Other, Native Hawaiian and Missing data

Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

Hospitalizations

Asthma Hospitalizations were defined by ICD-9 code 493 as primary diagnosis. Asthma hospitalizations among Kentucky Medicaid recipients were highest for children less than 5 years of age (Table 16).

Table 16: Asthma* Hospitalizations by Year and Age Group Among Medicaid Recipients, Kentucky, November 2008-October 2011

Age Group (years)	Nov 2008-Oct 2009	Nov 2009-Oct 2010	Nov 2010-Oct 2011
Under 5	757	709	557
5 - 17	566	483	408
18 - 34	192	172	132
35 - 64	626	568	501
Overall (0-64)	2,141	1,932	1,598

*Asthma listed as primary diagnosis

Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

Table 17: Asthma* Hospitalizations by Year and Race Among Medicaid Recipients, Kentucky, November 2008-October 2011

Race	Nov 2008-Oct 2009	Nov 2009-Oct 2010	Nov 2010-Oct 2011
Black	178	179	149
Other**	243	191	175
White	1,720	1,562	1,274
Overall	2,141	1,932	1,598

*Asthma listed as primary diagnosis

**"Other" race category includes Asian, American Indian, Other, Native Hawaiian and Missing data

Data source: November 2008-October 2011 Medicaid Data, Kentucky Department for Medicaid Services

CHAPTER 8: MORTALITY

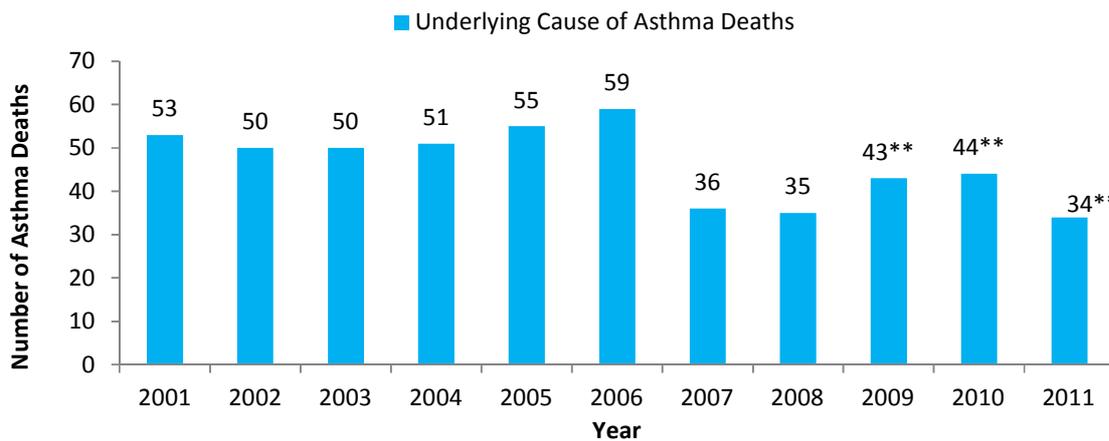
This chapter contains mortality data collected by the Kentucky Office of Vital Statistics. A detailed description of this data source can be found in Appendix A.

Asthma deaths that occurred in 1999 and later are classified according to ICD-10 (J45-J46). This chapter describes mortality data of Kentucky residents who died of asthma from 2001 to 2011 as noted on their death certificates. Age-adjusted rates were calculated using the direct standardization method presented per 100,000 population.

Asthma Mortality by Year, Kentucky 2001-2011

Overall asthma deaths decreased from an average of 53 in the first half of the previous decade (2001-2006) to fewer than 39 in the last half of the decade (2007-2011), a decline of 27.5% (Figure 41).

Figure 41: Asthma* Death Counts by Year, Underlying Cause of Death, Kentucky 2001-2011



* Asthma (ICD-10 codes J45.0, J45.1, J45.8, J45.9, and J46.0)

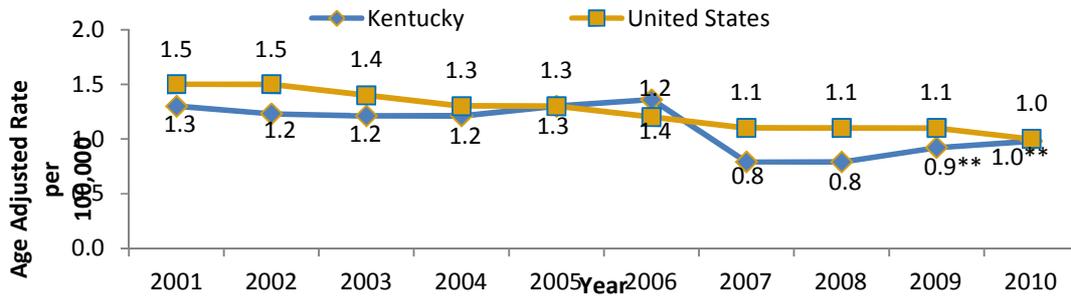
** Death data for the years 2009 through 2011 is still considered preliminary

Data Source: Kentucky Office of Vital Statistics

The age-adjusted asthma mortality rate with asthma as the underlying cause of death has decreased since 2001. In 2010 in Kentucky, age-adjusted deaths per 100,000 population are equal to the U.S. average of 1.0. (Figure 42)

The asthma death rate dropped dramatically in 2007 and remained consistently lower through 2011. While it is possible that the H3N2 influenza outbreak between 2003 and 2006 may have had some effect on asthma death rates increasing slightly and then dropping, no attempt was made to correlate the data.²⁸

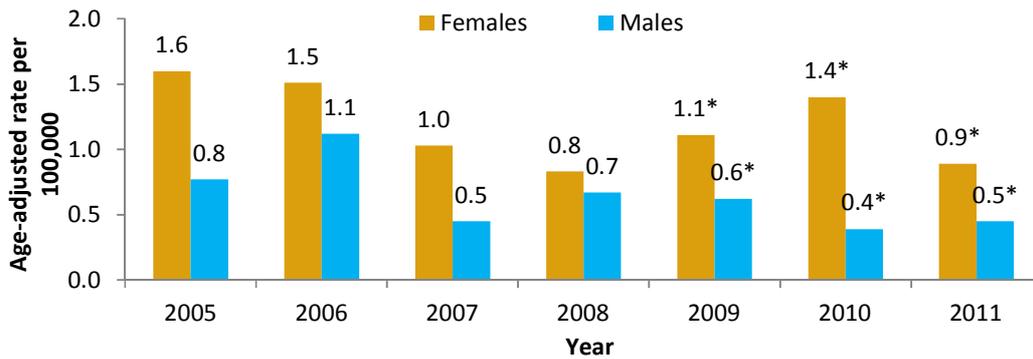
Figure 42: Age-Adjusted Asthma* Death Rates, Kentucky and U.S. 2001-2010



*Asthma as underlying cause of death (ICD-10 codes J45 and J46)
 Data Source: Kentucky Office of Vital Statistics, CDC Wonder data at www.cdc.wonder.gov for US data
 **2009 through 2010 KY data is considered preliminary

Asthma deaths are higher in females than males and are consistent with the higher asthma prevalence rates and hospitalization rates that are seen among females as compared to males (Figure 43).

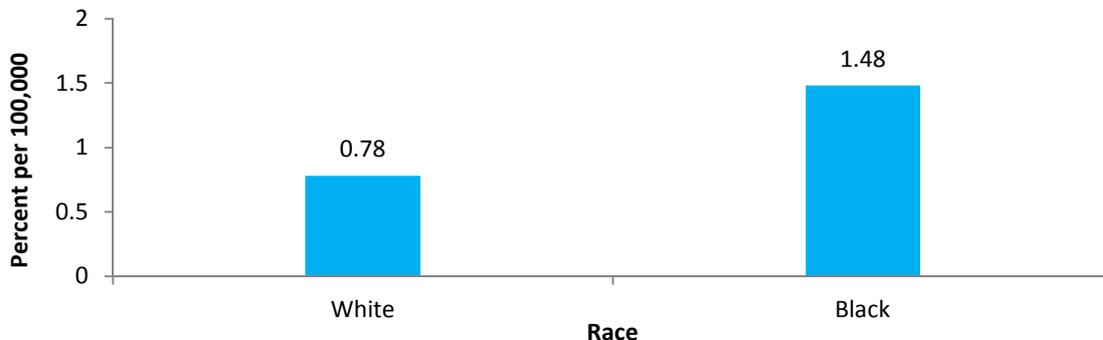
Figure 43: Age-Adjusted Asthma Mortality Rates by Gender and Year, Kentucky 2005-2011



*2009 through 2011 is still preliminary, 2009 and 2010 data is ≥ 90% complete
 Data Source: Kentucky Office of Vital Statistics. **2009 through 2011 KY data is considered preliminary

In Kentucky, a disparity exists in death rates among race. From 2007 to 2011, blacks (1.48 per 100,000) were twice as likely to die from asthma, than whites (0.78 per 100,000) (Figure 44).

Figure 44: Age-Adjusted Asthma Death Rate by Race, Kentucky 2007-2011



Note: Death rates for the years 2009 through 2011 are preliminary
 Data Source: Kentucky Office of Vital Statistics

CHAPTER 9: CONCLUSIONS

While asthma prevalence in Kentucky continues to increase, the rate of asthma hospitalizations, ED visits and deaths are gradually declining due in part to an increased focus on helping patients to access guidelines-based care. However, some Kentuckians are still disproportionately affected by asthma, including those in certain age and race groups, females, those living in certain geographic regions of the state, those with lower levels of education and the poor.

Across age categories, children under 5 years of age had the highest age-adjusted hospitalization rate. Adults age 65 and older had higher mortality rates, with the highest being among those 85 years of age and older. Males are more frequently affected by asthma during childhood while females are more frequently affected in adulthood. Adult females have higher asthma prevalence, more asthma attacks, more hospitalizations and ED visits, increased length of hospital stay and higher charges associated with asthma than males.

Kentucky's adult asthma prevalence falls in the top ten percent compared to all other states and is higher than the national rate. By geographic regions, current asthma prevalence in Area Development Districts was highest in Cumberland Valley, followed by FIVCO, Lincoln Trail, Lake Cumberland, and Big Sandy.

Risk factors for asthma include lower income levels, lower levels of educational attainment, and being a current or former smoker. Among race categories, blacks had higher asthma prevalence than whites, and deaths due to asthma were twice as high among blacks as compared to whites.

While asthma hospitalizations and ED visits in Kentucky show a declining trend, there are still many opportunities for improvement including increasing the use of asthma action plans and increasing self-management education, routine health care visits and healthcare access for asthma patients.

Poorly controlled asthma leads to decreased quality of life, therefore routine healthcare visits and use of EPR-3 guidelines for asthma management should be promoted for patients and providers along with such prevention strategies as flu vaccine for all age groups and reduction of exposure to secondhand smoke. In Kentucky, flu vaccination rates were higher among adults with asthma than among adults without asthma.

To address asthma as a public health issue, the Kentucky Department for Public Health and key stakeholders formed the Kentucky Asthma Partnership (KAP) in 2003 to bring together state and community partners and resources to reduce the burden of asthma in the Commonwealth and in 2007 created the infrastructure for a Kentucky Asthma Program.

With the adoption of the *2009 Kentucky State Plan for Addressing Asthma*, multiple evidence based strategies and activities were implemented across the state, and with funding from the CDC Kentucky was able to expand the reach of the asthma program. Those strategies include the dissemination of data in the form of this surveillance document and fact sheets, promoting expanded use of the NAEPP EPR- 3 guidelines among physicians and other providers, increasing the number of tobacco-free schools, creating more asthma friendly schools, improving asthma knowledge among school and day care staff, increasing the number of certified asthma educators in the state so that people with asthma receive appropriate asthma education, promoting kynect, Kentucky's insurance marketplace and expanded Medicaid as well as promoting the Kentucky Prescription Assistance Program so people who are uninsured or underinsured can receive their inhalers and other medications, creating a state Healthy Homes Training Center and providing this training to partners across Kentucky.

Kentucky has made progress in decreasing asthma hospitalizations and emergency department visits, but there is more work to do to meet the goals of improved health status and greater quality of life for all people with asthma.

Future

This document provides valuable data which will inform the Kentucky Asthma Partnership (KAP) and state and local decision makers as they set priorities related to asthma prevention and control in Kentucky. This document will be widely shared across the state and will be utilized in the revision of the Kentucky Asthma Strategic Plan for 2014.

The KAP will continue to prioritize and address asthma interventions across the state while focusing increased efforts on disproportionately affected populations.

The Kentucky Department for Public Health, Kentucky Asthma Management Program, Kentucky Asthma Partnership and other stakeholders will continue to utilize and disseminate asthma data and implement strategies for reducing the burden of asthma in Kentucky.

TECHNICAL NOTES

Report Terminology

Surveillance: The systematic collection of data pertaining to the occurrence of specific diseases, the analysis and interpretation of these data, and the dissemination of consolidated and processed information to contributors to the surveillance program and other interested persons. The CDC and vital statistics departments of state and local governments collect surveillance data on a continuing basis to determine whether an epidemic is taking place.

Prevalence: The total number of people in a population who have a certain disease at a specified time. Prevalence may be expressed as a proportion or percentage of the population.

Current Asthma Prevalence: The proportion of the population that reports currently having asthma. This is a subset of the population that has ever been diagnosed with asthma. People can be diagnosed with asthma but may no longer have an active form of the disease.

Lifetime Asthma Prevalence: The proportion of the population that has ever been diagnosed with asthma.

Statistical significance and 95% Confidence Interval: A way to identify a statistically significant difference between two or more groups in terms of the burden of disease or health-related event is to calculate a 95% confidence interval (95% CI). Since all values in a survey are estimates, the 95% confidence interval (95% CI) is the range of values within which the “true” value probably lies 95% of the time. If the two groups have 95% confidence intervals that overlap, it indicates that the true value could be the same in both groups, and the groups are conservatively assumed to have statistically similar rates. If the confidence intervals do not overlap, we assume that the groups being compared are significantly different from one another. A narrow confidence interval indicates high precision; while a wide interval indicates poor precision. The interpretation of the 95% confidence interval is that there is a 95% chance that the true value of the estimate lies within the range of the interval. Determination of statistical significance for data in this report is based on non-overlapping 95% confidence intervals. Although strictly speaking this is not a statistical test, it is a commonly accepted way to compare estimates.

Crude Rate: The crude rate is at times also referred to as “Rate.” It is the number of events that occur in a group divided by the population of that particular group.

Age-Specific Rate: An age-specific rate is a proportion based on both the number of events (numerator) and the population at risk (denominator) for that event restricted to a given age group.

Age-Adjusted Rate: Age-adjustment is a statistical process applied to rates of disease, death, injuries or other health outcomes which allows communities with different age structures to be compared. Rates were age-adjusted using the direct method by first multiplying an age-specific rate for each group by an age-specific weight. The weight used in calculating an age-adjustment rate for each age group is based on the proportion of that age group in the population. In this report, age-adjusted rates are based on the 2000 U.S. standard population. The weighted rates are then summed up across the age groups to give an overall age-adjusted rate (either per 10,000 or 100,000 population).

Count: merely refers to the number of cases of a disease or other health phenomena being studied. It is the simplest and most frequently performed quantitative measure in epidemiology.

Proportion: $(A/A+B)$; a fraction in which the numerator (A) includes only individuals who meet the case definition and the denominator totals the number of individuals who meet the case definition plus those in the study population who do not meet the case definition but are at risk.

Acronyms:

ACBS	Asthma Call Back Survey
ADD	Area Development District
ALAMS	American Lung Association of the Midland States
BRFSS	Behavioral Risk Factor Surveillance System
CAM	Complementary and Alternative Methods
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
CMS	Center for Medicaid Services
COPD	Chronic Obstructive Pulmonary Disease
DCBS	Department for Community Based Services
DMS	Department for Medicaid Services
ED	Emergency Department
EPR-3	Expert Panel Report
EPSDT	Early Periodic Screening Diagnosis and Treatment
FFS	Fee For Service
HEDIS	Healthcare Effectiveness Data and Information Set
HMO	Health Maintenance Organization
H3N2	Hemagglutinin Neuraminidase Virus (Influenza subtype A)
ICD	International Classification of Diseases
ICD-9-CM	International Classification of Diseases 9 th Clinical Modification
ICD-10	International Classification of Diseases, 10 th Revised version
KDPH	Kentucky Department for Public Health
KHA	Kentucky Hospital Association
KRDP	Kentucky Respiratory Diseases Program
KYTS	Kentucky Youth Tobacco Survey
LOS	Length of Stay
MCO	Managed Care Organization
NAEPP	National Asthma Education and Prevention Program
NCQA	National Committee for Quality Assurance
NHLBI	National Heart, Lung, and Blood Institute
OHP	Office of Health Policy
WRA	Work Related Asthma

APPENDICES

Appendix A: Data Sources

Behavioral Risk Factor Surveillance Survey (BRFSS)

The Behavioral Risk Factor Surveillance Survey (BRFSS) provides data that are used to estimate lifetime and current asthma prevalence in Kentucky adults aged 18 years and older. BRFSS is a state-based random digit-dialed telephone survey of the non-institutionalized, civilian, adult (18 and over) population. Using the Random Child Selection component of the BRFSS, data are gathered to generate estimates of lifetime and current asthma prevalence in children.

For adults, there are two asthma related questions on the BRFSS core module that are asked every year by all states. The CDC has included questions on asthma prevalence on the BRFSS since 1999.

The core questions included in the survey allow for lifetime and current asthma prevalence estimates. These estimates were created to distinguish between individuals who have been diagnosed with asthma at any time in the past and those who report still having asthma. Inclusion of these questions in the core section allows state-to-state comparisons of asthma prevalence.

The BRFSS is a useful means of estimating the prevalence of asthma, but it has some limitations. Current asthma data represent only the non-institutionalized, civilian population. Other limitations include self-reported bias and coverage bias. BRFSS has tried to decrease the limitation of landline only surveys by incorporating cell phone surveys since 2011. Recall bias may occur as responses are self-reported. Non-reporting or under-reporting is also a potential bias, since individuals with symptoms of asthma who may never have been diagnosed by a physician or healthcare provider are not counted.

Kentucky collects data on childhood asthma using the BRFSS childhood asthma module every two years. National estimates from BRFSS were available for comparison to Kentucky estimates. The most recent child asthma data available is from 2012. The BRFSS assesses childhood asthma prevalence by asking an adult respondent about the asthma status of one child chosen at random living in the household.

BRFSS Asthma Call Back Survey (ACBS)

The Asthma Call Back Survey (ACBS) is a follow up survey conducted approximately two weeks after the Behavioral Risk Factor Surveillance Survey (BRFSS). <http://www.cdc.gov/brfss/acbs/> BRFSS respondents who have a positive response to the question regarding ever having been diagnosed with asthma are eligible for the ACBS. Kentucky conducted the Adult ACBS for the first time in 2011. [NOTE: Kentucky Adult ACBS 2011 has the following limitations: All Adult ACBS interviews were conducted only during November 2011 to January 2012 rather than 2 weeks after the initial BRFSS interviews. Kentucky data cannot be compared nationally and can be used for state estimates only.

Work related asthma data from ACBS 2011 are subject to some limitations. The results may be underestimates of the actual proportion of work related asthma because work related asthma is often considered underdiagnosed in the United States.^{29,30} ACBS might also be subject to selection bias because BRFSS respondents with asthma were asked if they agreed to be called back for ACBS. Those who agreed to participate in ACBS might have more severe asthma or might be more likely to attribute asthma to their work.³¹

Hospitalization Data

Hospital discharge data are collected by the Kentucky Hospital Association through a contract with the Cabinet for Health and Family Services' Office of Health Policy. Hospitalization discharge data with an International Classification of Diseases Ninth Revision code 493.0-493.9 as the primary diagnosis are included in this report. The data presented in the report are from 2003 to 2012. Rates from 2003 to 2012 are based on the U.S. Census Bureau's Annual County Resident Population Estimates by Age, gender, Race and Hispanic Origin: April 1, 2003 to July 1, 2012.^{32,33} The rates in this report are age-adjusted to the 2000 U.S. population adjustment weights so that comparisons can be made between populations of different age distributions.³⁴

Medicaid

Medicaid is a health and long-term care coverage program that is jointly financed by states and the federal government, enacted in 1965 through amendments to the Social Security Act. Medicaid data from the fee-for-service (FFS) group was analyzed each year from October 2008 to November 2011 by the Department of Medicaid Services. Under the fee-for-service approach services are rendered by a physician, hospital or other qualified healthcare provider who then bills and receives payment for each service (such as physician office visit, hospitalization, emergency department visit, etc.). The FFS group was chosen as the data was available for this group. The time period analyzed was October 2008 to November 2011. Asthma case definition was based on HEDIS measures as developed by the National Committee for Quality Assurance. "Universe asthma prevalence" is a slightly less restrictive asthma case definition used to include persons with less severe asthma (those who may have had only one or two office visits for asthma during the year).

Managed care: Medicaid has traditionally operated on a fee-for-service basis, but due to the growing cost of medical services, a Medicaid managed care system has been introduced. Under the managed care system, the managed care organization (MCO) receives a fee for each Medicaid recipient it serves. Beginning in November 2011, Medicaid managed care was expanded statewide in Kentucky, and additional companies were authorized to provide coverage in the state.

Mortality Data

For the purpose of this report an asthma death is defined as any death in which asthma was listed as the primary cause of death according to the International Classification of Diseases Tenth revision (ICD-10) using codes J45 and J46. Mortality data were obtained from the Kentucky Office of Vital Statistics.

Rates for 2001-2011 are based on the U.S. Census Bureau's Annual County Resident Population Estimates by Age, Gender, Race: April 1, 2000 to July 1, 2011. Rate for 2001-2011 were age-adjusted to the U.S. 2000 standard population so that comparisons can be made between populations of different age distributions. Rates from 2009 through 2011 are based on preliminary number of deaths from asthma and are not the final death rate for those years.

Kentucky Youth Tobacco Survey (KYTS)

The Kentucky Youth Tobacco Survey (KYTS) is a survey used to measure awareness, attitudes and behaviors related to tobacco use in public middle and high school students in Kentucky. This survey is coordinated by the CDC and is administered by the Kentucky Department for Public Health's Tobacco Prevention and Cessation Program. Questions about asthma prevalence are included in this survey providing additional information about asthma in Kentucky's youth. Asthma related questions on the 2010 KYTS survey were: "Has a doctor, nurse or other health professional ever told you that you had asthma?" for lifetime prevalence and "Do you still have asthma?" for current prevalence. Unlike the BRFSS, in which adult respondents answer questions on behalf of children and adolescents in their household, questions in the KYTS are answered by the students

directly (self-reported). In addition to providing information on the prevalence of asthma among the student population, these surveys allow prevalence to be examined based on various demographic and behavioral variables. The results of KYTS questions are only representative of the public middle and high school student population in Kentucky.

National Survey of Children’s Health (NSCH)

The National Survey of Children’s Health is a national survey conducted by telephone in English and Spanish for a third time during 2010-2012. It was previously administered in 2007-2008 and 2003-2004. This survey provides a broad range of information about children’s physical, emotional, and behavioral health and well-being in combination with information on the child’s family context and neighborhood environment. Information is collected in a manner that allows comparisons among states as well as nationally. Respondents are parents or guardians who are most familiar with the child’s health. However, the results are weighted to reflect the population of children and youth ages 0-17, not parents or families nationally and in each state. Telephone numbers are called at random to identify households with one or more children under 18 years old. In each household, one child was randomly selected to be the subject of the interview. Questions related to asthma and school absenteeism (6-17 years) included: 1.) “Has a doctor or healthcare provider ever told you that (single child selected for the survey.) had Asthma?” 2.) “Does (single child) currently have asthma?” and 3.) “During the past 12 months, about how many days did the child miss school because of illness or injury, age 6-17?” This survey is based on a 240-day school year.

National Survey of Children with Special Health Care Needs (NS-CSHCN)

The National Survey of Children with Special Health Care Needs (NS-CSHCN) is a national survey that was conducted by telephone in English and Spanish for the first time in 2001. The survey was conducted a second time in 2005-2006 and for a third time in 2009-2010. The survey provides a broad range of information about the health and functional status of children with special healthcare needs collected in a manner that allows for comparisons between states and at the national level. Telephone numbers are called at random to identify households with one or more children under 18 years old. Each child in the household is screened for special healthcare needs using the CSHCN Screener. In each household, one child was randomly selected to be the subject of the interview. The survey results are weighted to represent the population of non-institutionalized children with special health care needs 0-17 nationally and in each of the 50 states plus the District of Columbia. The CSHCN interview includes questions on demographics of the child and family including age, gender, race/ethnicity, household income, parental education, family structure, primary language spoken in the home, and asthma-related questions. The survey also included the following asthma-related question: If the child is over 5 years of age, “During the past 12 months, that is since (one-year-ago), about how many days did the child miss school because of illness or injury (i.e. asthma).” The NS-CSHCN is sometimes called SLAITS because the sampling and data collection for the survey is conducted using the State and Local Area Integrated Telephone Survey (SLAITS) mechanism and approach developed by the National Center for Health Statistics to quickly and consistently collect information on a variety of health topics at the state and local levels. This survey is based on a 240-day school year.

Appendix B: Asthma-Specific Healthy People 2020 Objectives

- 1) Reducing asthma deaths.
 - 1.1 Reduce asthma deaths among children and adults under age 35 years
 - 1.2 Reduce asthma deaths among adults aged 35 to 64 years old to 6.0 deaths per million
 - 1.3 Reduce asthma deaths among adults aged 65 years and older to 22.9 deaths per million
- 2) Reducing hospitalizations for asthma
 - 2.1 Reduce hospitalizations for asthma among children under age 5 years to 18.1 hospitalizations per 10,000
 - 2.2 Reduce hospitalizations for asthma among children and adults aged 5 to 64 years to 8.6 hospitalizations per 10,000
 - 2.3 Reduce hospitalizations for asthma among adults aged 65 years and older to 20.3 hospitalizations per 10,000
- 3) Reducing Emergency Department (ED) visits for asthma
 - 3.1 Reduce ED visits for asthma among children under 5 years to 95.6 ED visits per 10,000
 - 3.2 Reduce ED visits for asthma among children and adults aged 5 to 64 years to 49.7 ED visits per 10,000
 - 3.3 Reduce ED visits for asthma among children and adults aged 65 years and older to 13.8 ED visits per 10,000
- 4) Reducing activity limitations among persons with current asthma to 10.2 percent
- 5) Reducing the proportion of persons with asthma, who miss school or work days
- 6) Increasing the proportion of persons with current asthma who receive formal patient education to 14.4 percent
- 7) Increasing the proportion of persons with current asthma who receive appropriate asthma care according to the National Asthma Education and Prevention Program (NAEPP)
 - 7.1 Increase the proportion of persons with current asthma who receive written asthma management plans from their health care provider according to National Asthma Education and Prevention Program (NAEPP) guidelines to 36.8 percent
 - 7.2 Increase the proportion of persons with current asthma with prescribed inhalers who receive instruction on their use according to National Asthma Education and Prevention Program (NAEPP) guidelines
 - 7.3 Increase the proportion of persons with current asthma who receive education about appropriate response to an asthma episode, including recognizing early signs and symptoms or monitoring peak flow results, according to National Asthma Education and Prevention Program (NAEPP) guidelines to 68.5 percent
 - 7.4 Increase the proportion of persons with current asthma who do not use more than one canister of short-acting inhaled beta agonist per month according to National Asthma Education and Prevention Program (NAEPP) guidelines to 90.2 percent
 - 7.5 Increase the proportion of persons with current asthma who have been advised by a health professional to change things in their home, school, and work environments to reduce exposure to irritants to allergens to which they are sensitive according to National Asthma Education and Prevention Program (NAEPP) guidelines to 54.5 percent
 - 7.6 (Developmental) Increase the proportion of persons with current asthma who have had at least one routine follow up visit in the past 12 months according to National Asthma Education and Prevention Program (NAEPP) guidelines
 - 7.7 (Developmental) Increase the proportion of persons with current asthma whose doctor assessed their asthma control in the past 12 months according to National Asthma Education and Prevention Program (NAEPP) guidelines to 54.5 percent

- 7.8 (Developmental) Increase the proportion of persons with current asthma who have discussed with a doctor or health professional whether their asthma was work related according to National Asthma Education and Prevention Program (NAEPP) guidelines to 54.5 percent
- 8) Increasing the number of states and territories (including the District of Columbia) with a comprehensive surveillance system for tracking asthma cases, illness, and disability at the state level to 47 areas.

ENDNOTES

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