

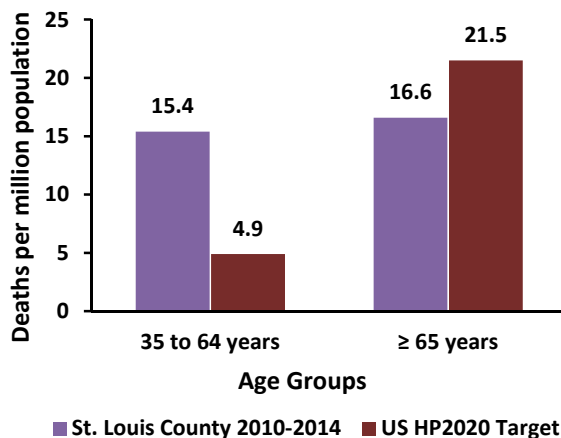
Asthma is a chronic lung disease that inflames (swells) and narrows the airways (tubes that carry air into and out of your lungs).<sup>1</sup> It affects people of all ages, but usually begins in childhood. Asthma causes recurrent wheezing, chest tightness, shortness of breath, and nighttime or early morning coughing. Symptoms occur when airways react to exposures called triggers. Common triggers of asthma symptoms are: cigarette smoke; air pollution; chemicals or dust in the workplace; allergens from dust, animal fur, cockroaches, mold, and pollen; viral respiratory infections (a cold or the flu); fragrances; and physical activity.<sup>2</sup> An asthma “attack” (exacerbation) occurs when symptoms become more intense or when many happen at the same time. Severe asthma attacks can require emergency care and even be life threatening.<sup>1</sup>

In 2014, Chronic Lower Respiratory Disease (CLRD) was the fifth leading cause of death in St. Louis County, accounting for 443 deaths;<sup>3</sup> 5.2 percent of CLRD deaths were caused by Asthma. Similar proportions of adults in St. Louis County (14 percent) and the state of Missouri (15 percent) have ever been told they have asthma.<sup>4,5</sup> Similarly, around 9 percent of St. Louis County and 10 percent of Missouri adults, have been told they currently have asthma.<sup>4,5</sup>

- During 2010-2014, there were, on average, 1.2 asthma deaths per 100,000 population per year.
- In 2014, there were over 1,400 inpatient hospitalizations (14.4 per 10,000 population) and nearly 6,600 emergency department (ED) visits (7.4 per 1,000) for asthma in St. Louis County.
- Children under age 5 had the highest burden of asthma inpatient hospitalizations (39.8 per 10,000 population) and ED visits (219.9 per 10,000) in 2014.
- Blacks/African Americans had the highest rates of hospitalizations and ED visits for 2010-2014—38.7 per 10,000 and 20.2 per 1,000, respectively.
- High and very high level poverty neighborhoods had the highest burden of hospitalizations and ED visits for asthma.
- The Inner North area of St. Louis County had the highest rates of hospitalizations (34.8 per 10,000) and ED visits (16.9 per 1,000) during 2010-2014.

### U.S. Healthy People 2020 Objective: Reduce asthma deaths

**Figure 1. Deaths from Asthma, St. Louis County, 2010-2014 and Healthy People 2020 Targets**



Older adults have the greatest burden of asthma deaths. For 2010–2014, adults 35–64 years in St. Louis County had an asthma death rate three times higher than the Healthy People (HP) 2020 target of 4.9 deaths per million population.<sup>6</sup> However, the asthma death rate among adults aged 65 years and older in St. Louis County was below the HP 2020 target of 21.5 deaths per million population.<sup>6</sup>

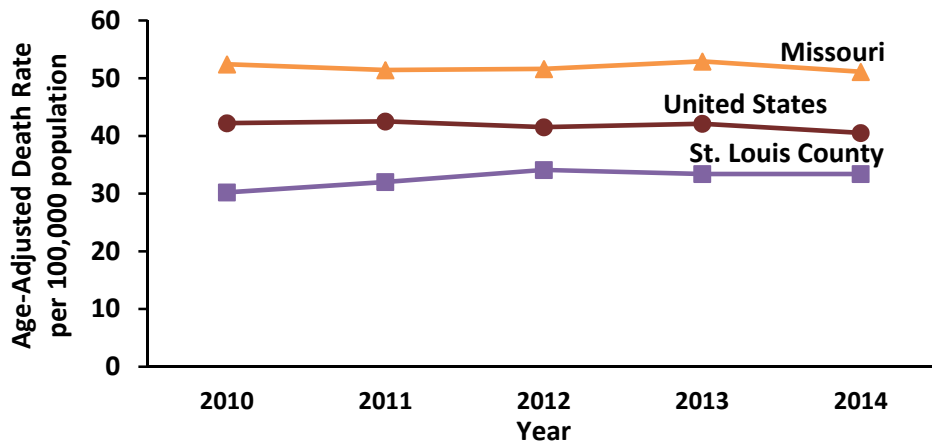
Sources: Missouri DHSS, Bureau of Vital Statistics and HealthyPeople.gov. Data are crude mortality rates.

## Mortality

Asthma deaths are uncommon, but are a focal point for public health prevention efforts because high-quality, preventive health care and patient education should mitigate the severe impact of asthma, including death.<sup>7</sup> Risk factors for asthma deaths include multiple ED visits or a hospitalization in the past year related to asthma, overuse of short-term relief medications, and lack of a written asthma action plan (i.e., instructions for medication management and environmental control measures).<sup>8</sup>

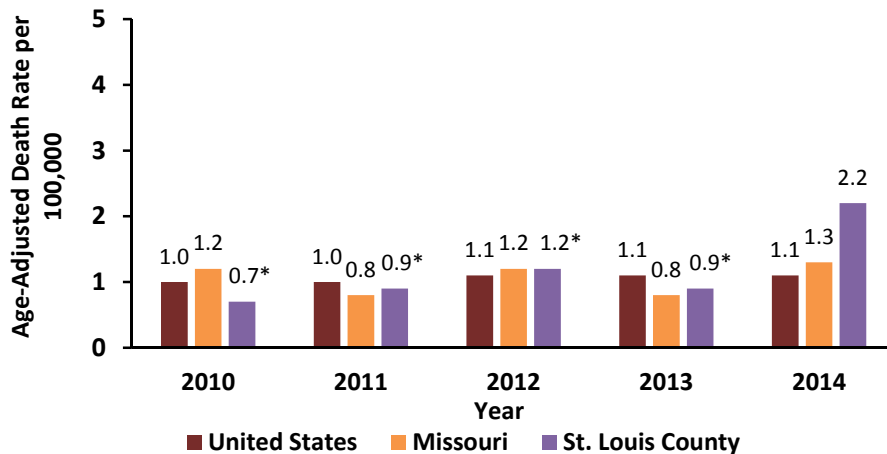
Asthma is a component of CLRD, accounting for 3 percent of CLRD deaths in the county, on average. During 2010–2014, St. Louis County consistently had lower age-adjusted CLRD death rates than Missouri and the United States (Figure 2). However, Figure 3 shows St. Louis County had a significantly higher rate of asthma deaths than the U.S. in 2014 (additional detail in Appendix 1.2). The trend in asthma death rates was not significant for St. Louis County, Missouri and the U.S. during 2010–2014.

**Figure 2. Age-Adjusted Rates for Chronic Lower Respiratory Disease Deaths, St. Louis County, Missouri and United States, 2010–2014.**



Sources: Missouri Department of Health and Senior Services (DHSS), Bureau of Vital Statistics and the Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS).

**Figure 3. Age-Adjusted Rates for Asthma Deaths, St. Louis County, Missouri and United States, 2010–2014.**



Sources: Missouri DHSS, Bureau of Vital Statistics, MICA Death, and CDC WONDER Online.

\*Interpret with caution; too few cases to meet precision standard (relative standard error <30%).

**Table 1** shows there were, on average, 12 deaths per year during 2010–2014. Again, asthma deaths are uncommon and few occurred in St. Louis County during 2010–2014. However, the total number of deaths from asthma increased from 2010 to 2014 (**Appendix 1.2**). In particular, there were significantly more asthma deaths among Blacks/African Americans (3.2 deaths per 100,000 population) and residents living in the Inner North area (3.1 per 100,000) as compared to the St. Louis County rate (1.2 per 100,000). Disparities in deaths, ED visits, and inpatient hospitalizations caused by asthma are likely attributable to lack of access to high-quality health care and education for patients to control their asthma.<sup>8</sup>

**Table 1. Asthma Deaths per 100,000 Population, St. Louis County, 2010–2014 Average.**

	Rate	95% Confidence Interval	Count per Year
<b>St. Louis County</b>	1.2	0.9 to 1.5	12
<b>Age Group</b>			
< 18 years	0.4*	0.1 to 0.9	1
18 – 24 years	0.7*	0.1 to 1.6	1
25 – 44 years	1.6	1.0 to 2.4	4
45 – 64 years	1.5	0.9 to 2.2	4
65 years and over	1.7	0.9 to 2.7	3
<b>Gender</b>			
Male	1.3	0.9 to 1.9	6
Female	1.0	0.7 to 1.5	6
<b>Race/Ethnicity</b>			
Asian	0	0.0 to 0.0	0
Black/African American	3.2	2.2 to 4.4	7
Hispanic or Latino	0	0.0 to 0.0	0
Multiple	0	0.0 to 0.0	0
White	0.6	0.4 to 0.9	5
<b>Neighborhood Poverty</b>			
Very High	2.4*	0.8 to 5.1	1
High	2.5	1.3 to 4.1	3
Medium	1.8	1.1 to 2.7	5
Low	0.6	0.3 to 0.9	4
<b>Geographic Area</b>			
Central	0.7*	0.2 to 1.5	1
Inner North	3.1	2.0 to 4.5	6
Outer North	0.9	0.5 to 1.6	2
South	0.7*	0.2 to 1.4	1
West	0.5*	0.2 to 1.0	2

**Comparisons:**

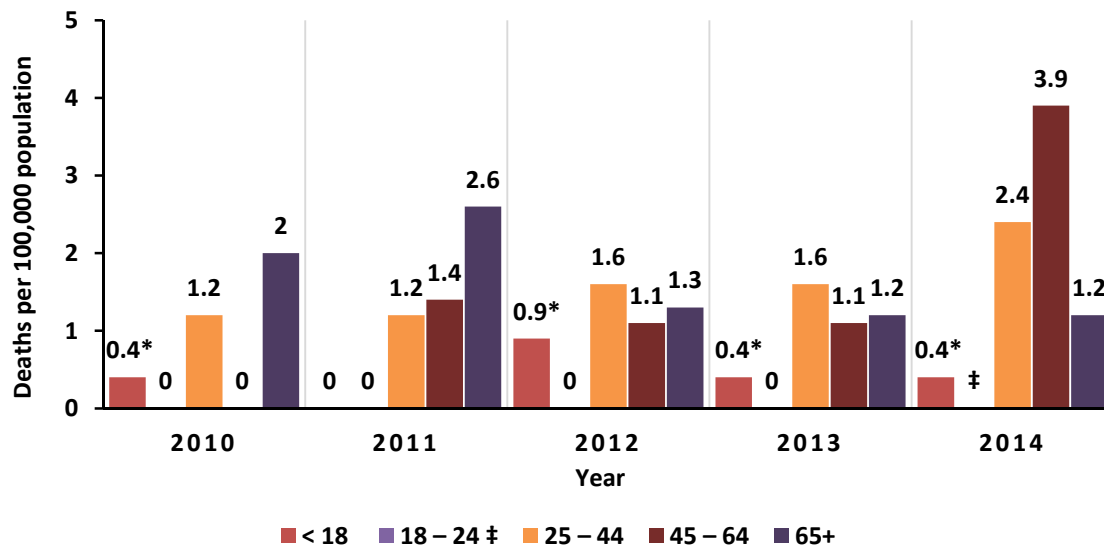
- Higher than St. Louis County rate
- Lower than St. Louis County rate

**Notes:**

Source: Missouri Department of Health and Senior Services (DHSS), Bureau of Vital Statistics.  
Case Definition: International Classification of Diseases, Tenth Revision (ICD-10) codes J45-J46.  
Rates are age-adjusted to the 2000 US population (not including Age Group rates).  
\*Interpret with caution; too few cases to meet precision standard (relative standard error <30%).

**Figure 4** displays the age-specific death rates for asthma in St. Louis County for 2010–2014. The rates for adults aged 18-24 are not shown for 2014 because there were too few cases to report reliable rates. The small number of deaths per year in each group caused the rates to vary. Further, there were no significant trends in age-specific asthma death rates (**Appendix 1.2**). Deaths among adults aged 45-64 are considered premature and preventable.

**Figure 4. Age-Specific Death Rates for Asthma, St. Louis County, 2010-2014**



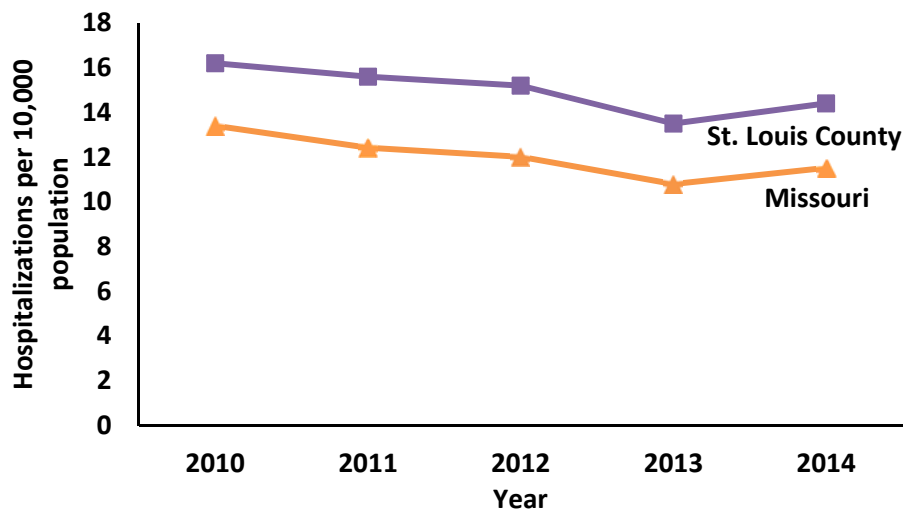
Source: Missouri DHSS, Bureau of Vital Statistics. \*Interpret with caution; too few cases to meet precision standard (relative standard error <30%). ‡Rate suppressed to protect confidentiality or too few cases to report reliable rates.

## Hospitalizations

Inpatient hospital stays for asthma exacerbations are severe, adverse outcomes that are considered preventable through high-quality health care, patient education, and management (control) of asthma.<sup>8</sup> This section describes trends for asthma hospitalizations—inpatient hospitalizations with a principal discharge diagnosis of *International Classification of Diseases, Ninth Revision (ICD-9) code 493*—among St. Louis County, Missouri residents from 2010 through 2014.<sup>9</sup> It is important to note that the basis for hospitalization rates for asthma is the number of events, not the number of persons hospitalized. When rates and 95 percent confidence intervals (95% CIs) are not specified in figures or text, they can be found in **Appendix 2**.

There were consistently, significantly-higher rates of hospitalizations for asthma in St. Louis County as compared to Missouri. The county rates decreased from 16.2 hospitalizations per 10,000 population in 2010 (95% CI 15.4-17.0) to 13.5 (95% CI 12.7-14.2) in 2013, and then did not increase significantly in 2014 (**Figure 5**). Similarly, the Missouri rates decreased from 13.4 hospitalizations per 10,000 population in 2010 (95% CI 13.1-13.7) to 10.8 (95% CI 10.5-11.1) in 2013, but increased again to 11.5 in 2014 (95% CI 11.3-11.8).

**Figure 5. Age-Adjusted Rates for Asthma Hospitalizations, St. Louis County and Missouri, 2010-2014**



Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination. Missouri Information for Community Assessment (MICA), Inpatient Hospitalizations.

**Table 2** shows that the age-adjusted hospitalization rate for asthma during 2010-2014 was 15.0 per 10,000 population in St. Louis County. Persons who were younger than 18 years, female, Black/African American, lived in a medium to very high level poverty neighborhood, and/or lived in Inner North had significantly higher rates of hospitalization for asthma as compared with to county overall.

**Table 2. Asthma Hospitalizations per 10,000 Population, St. Louis County, 2010-2014 Average.**

	Rate	95% Confidence Interval	Count per Year
<b>Missouri</b>	12.0	11.9 to 12.2	7,243
<b>St. Louis County</b>	15.0	14.6 to 15.3	1,463
<b>Age Group</b>			
< 18 years	23.1	22.2 to 24.0	526
18 – 24 years	8.1	7.2 to 8.9	71
25 – 44 years	11.6	11.0 to 12.2	283
45 – 64 years	12.8	12.2 to 13.3	361
65 years and over	14.1	13.3 to 15.0	222
<b>Gender</b>			
Male	13.6	13.1 to 14.1	618
Female	15.9	15.4 to 16.4	845
<b>Race/Ethnicity</b>			
Asian	2.7	1.8 to 3.7	7
Black/African American	38.7	37.6 to 39.9	906
Hispanic or Latino	6.9	5.4 to 8.6	18
Multiple	2.4	1.5 to 3.5	9
White	7.1	6.8 to 7.4	509
<b>Neighborhood Poverty</b>			
Very High	40.0	37.6 to 42.5	219
High	32.6	31.1 to 34.2	374
Medium	17.7	16.9 to 18.5	404
Low	7.9	7.6 to 8.3	466
<b>Geographic Area</b>			
Central	11.8	10.9 to 12.7	145
Inner North	34.8	33.6 to 36.1	640
Outer North	14.4	13.7 to 15.1	352
South	7.8	7.3 to 8.4	160
West	5.4	5.0 to 5.8	165

**Comparisons:**

- Higher than St. Louis County rate
- Lower than St. Louis County rate

**Notes:**

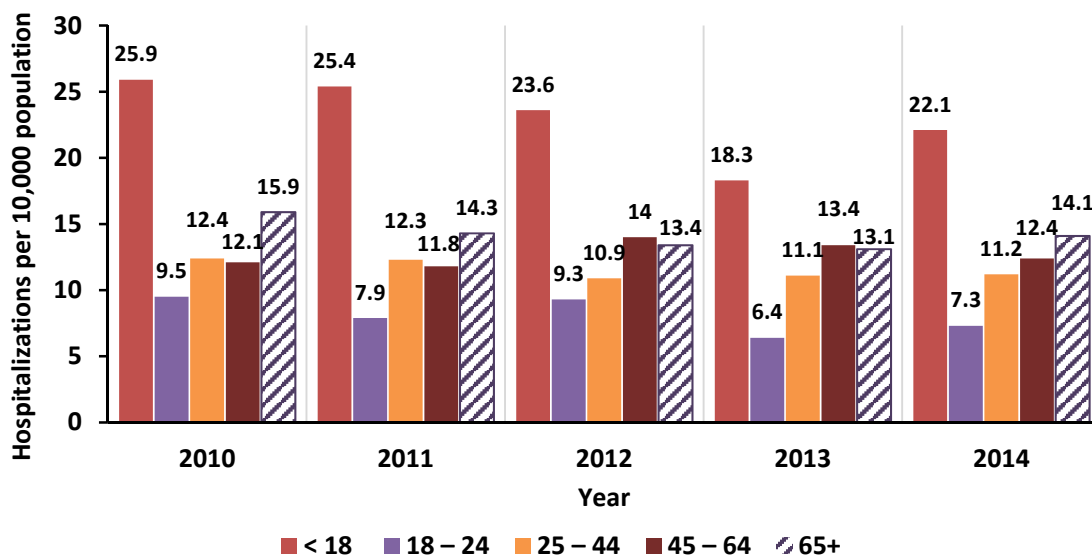
Sources: MICA, Inpatient Hospitalizations. Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

Case Definition: International Classification of Diseases, Ninth Revision (ICD-9) code 493.

Rates are age-adjusted to the 2000 US population (not including Age Group rates).

Rates of hospitalization for asthma by selected age groups are shown in **Figure 6**. County residents younger than 18 had the highest burden of asthma hospitalizations. Among the group aged less than 18 years, rates of hospitalization for asthma decreased from 25.9 per 10,000 population in 2010 to 18.3 in 2013, and then slightly increased to 22.1 in 2014. For adults aged 18 and older, hospitalizations for asthma mostly increased with each increasing age group. Within each age group (18-24, 25-44, 45-64, 65+), the rates were largely stable during 2010-2014 (see **Appendix 2** for more detail).

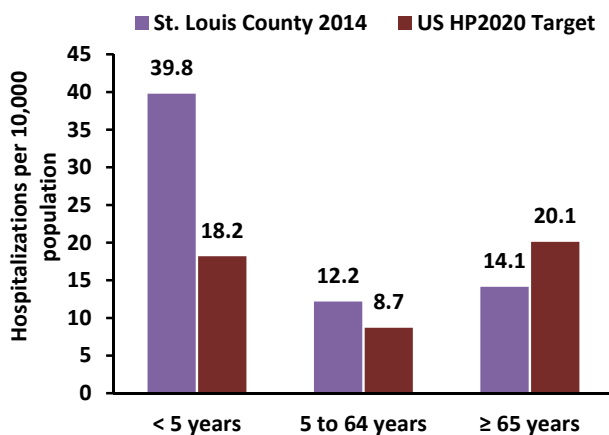
**Figure 6. Age-Specific Rates for Asthma Hospitalizations, St. Louis County, 2010-2014**



Source: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

**U.S. Healthy People 2020 Objective: Reduce hospitalizations for asthma**

**Figure 7. Hospitalizations for Asthma, St. Louis County, 2014 and Healthy People 2020 Targets**

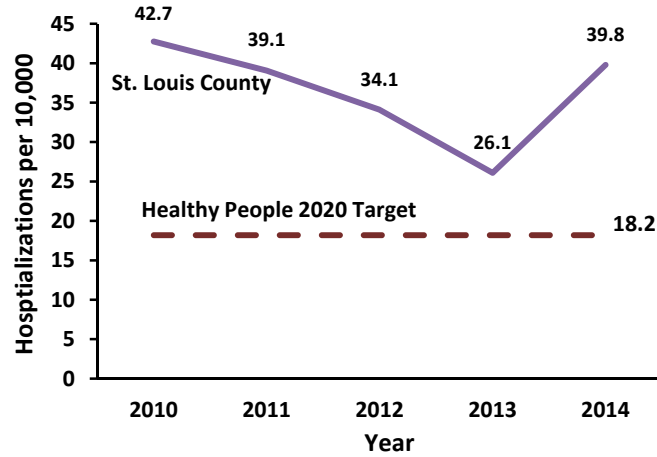


Young children in St. Louis County had the greatest burden of hospitalizations from asthma. In 2014, the hospitalization rate for asthma among children under 5 years old (39.8 per 10,000) was over two times the HP 2020 target of 18.2 per 10,000 population.<sup>6</sup> St. Louis County adults 65 years old and older had a lower rate of hospitalizations for asthma (14.1) than the HP 2020 target of 20.1 per 10,000 population.<sup>6</sup>

Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination and HealthyPeople.gov. Data are crude mortality rates.

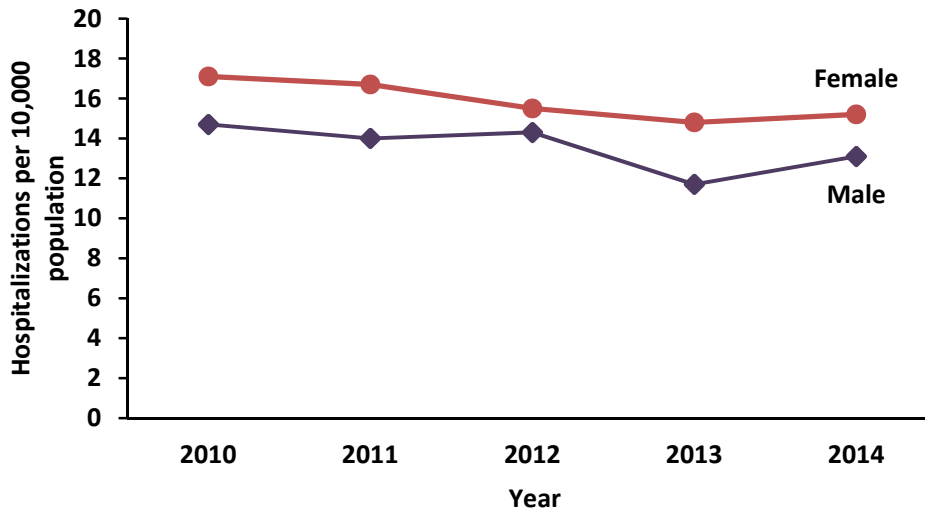
**Figure 8. Hospitalizations for Asthma, Children <5 years, St. Louis County, 2010-2014, and Healthy People 2020 Target Rate**

In St. Louis County, hospitalizations for asthma among children under age 5 decreased significantly from 2010 (42.7, 95% CI: 37.6-48.2) to 2013 (26.1, 95% CI: 22.1-30.4). However, in 2014, there were 39.8 hospitalizations for asthma per 10,000 population (95% CI: 34.8-45.1) among children under age 5, a significant increase from 2013. Moreover, the St. Louis County rates were nearly 1.5 to 2.5 times higher than the HP 2020 target rate during 2010–2014.



Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination and HealthyPeople.gov.  
Data are crude mortality rates.

**Figure 9. Age-Adjusted Rates for Asthma Hospitalizations by Sex, St. Louis County, 2010-2014**



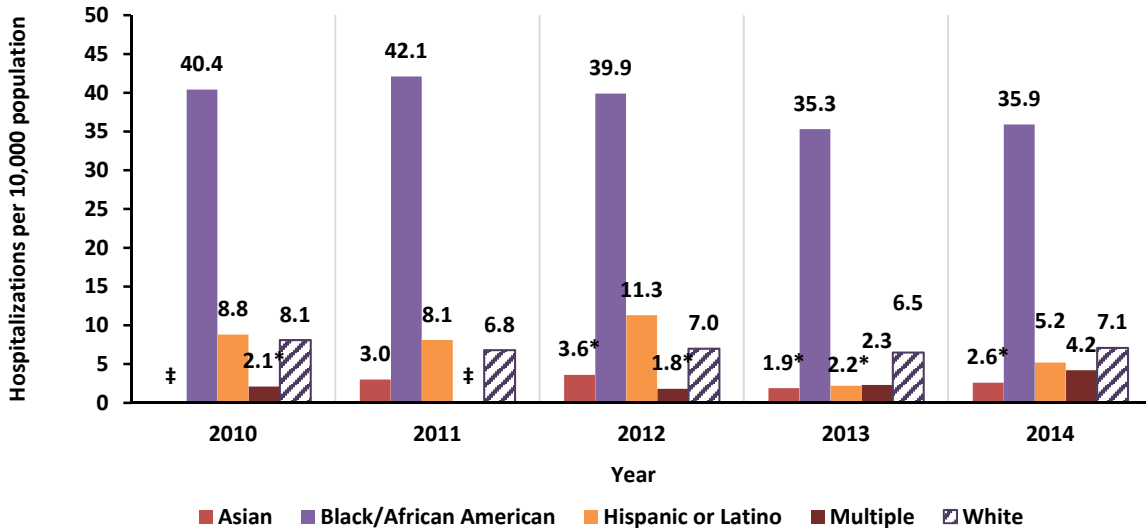
Source: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

**Figure 9** shows trends in hospitalization rates for asthma for male and female St. Louis County residents. Among females, hospitalizations for asthma were highest in 2010 (17.1, 95% CI 16.0-18.3) and lowest in 2013 (14.8, 95% CI 13.7-15.9). Females had significantly higher rates as compared to males in 2010, 2011, and 2013 (17.1 vs 14.7, 16.7 vs 14.0, and 14.8 vs 11.7, respectively). Males consistently had lower rates of hospitalizations for asthma. There was a significant decrease in male hospitalizations for asthma from 2012 (14.3 per 10,000, 95% CI 13.2-15.5) to 2013 (11.7, 95% CI 10.7-12.7).



Blacks/African Americans had substantially higher rates of hospitalizations for asthma compared to all other race and ethnic groups (**Figure 10**). They were, on average, 5 and 7 times higher than Whites and Hispanics or Latinos, respectively, during 2010-2014. The highest rate of hospitalizations among Blacks/African Americans was in 2011 (42.1, 95% CI 39.4-44.8) and the lowest rate of hospitalizations among Blacks/African Americans was in 2013 (35.3, 95% CI 32.9-37.8). The decline in hospitalizations for asthma among Blacks/African Americans from 2011 to 2013 was significant.

**Figure 10. Age-Adjusted Rates for Asthma Hospitalizations by Race and Ethnicity, St. Louis County, 2010-2014**

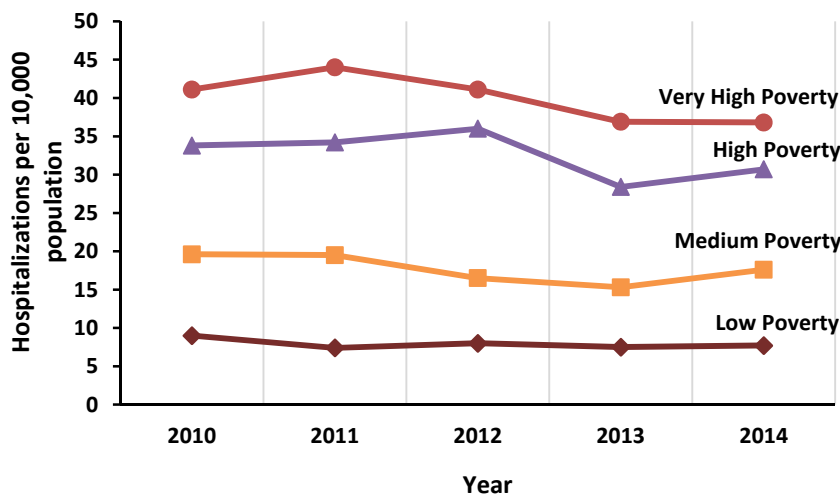


Source: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

\*Interpret with caution; too few cases to meet precision standard (relative standard error <30%).

‡Rate suppressed to protect confidentiality or too few cases to report reliable rates.

**Figure 11. Age-Adjusted Rates for Asthma Hospitalizations by Neighborhood Poverty Level, St. Louis County, 2010-2014**

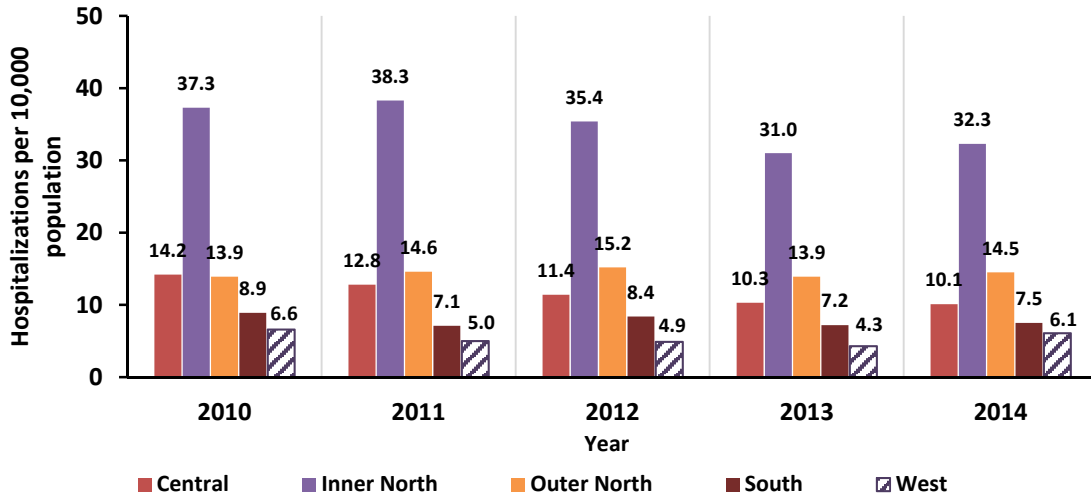


The relationship between neighborhood poverty level and hospitalizations for asthma is shown in **Figure 11**. In general, very high and high poverty level neighborhoods had significantly higher rates of hospitalization compared to medium and low poverty level neighborhoods (see **Appendix 2**). Among high poverty level neighborhoods, there was a significant decrease in asthma hospitalizations from 2012 to 2013 (36.0, 95% CI 32.6-39.7 vs 28.4, 95% CI 25.4-31.7).

Source: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

**Figure 12** shows that the Inner North area had the highest rates of hospitalizations for asthma. The highest Inner North rate was in 2011 (38.3, 95% CI 35.4-41.2), and the lowest Inner North rate was in 2013 (31.0, 95% CI 28.4-33.6). Among all other sub-county geographic areas, rates of hospitalization for asthma were stable during 2010 to 2014. **Appendix 2** has more detailed comparisons for these rates.

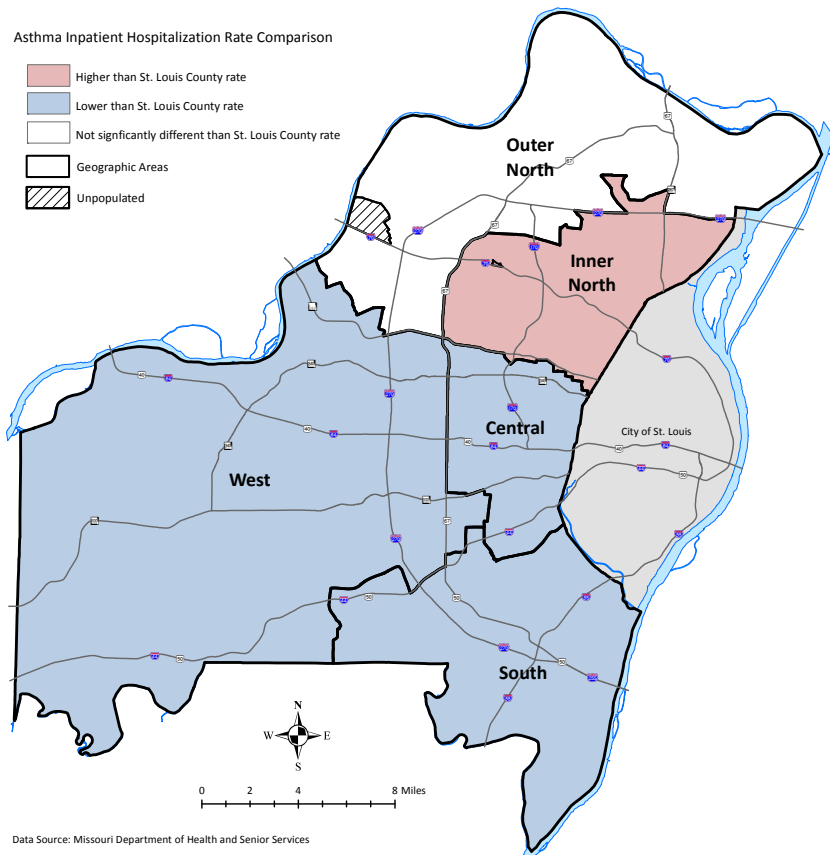
**Figure 12. Age-Adjusted Rates for Asthma Hospitalizations by Sub-County Geographic Area, St. Louis County, 2010-2014**



Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

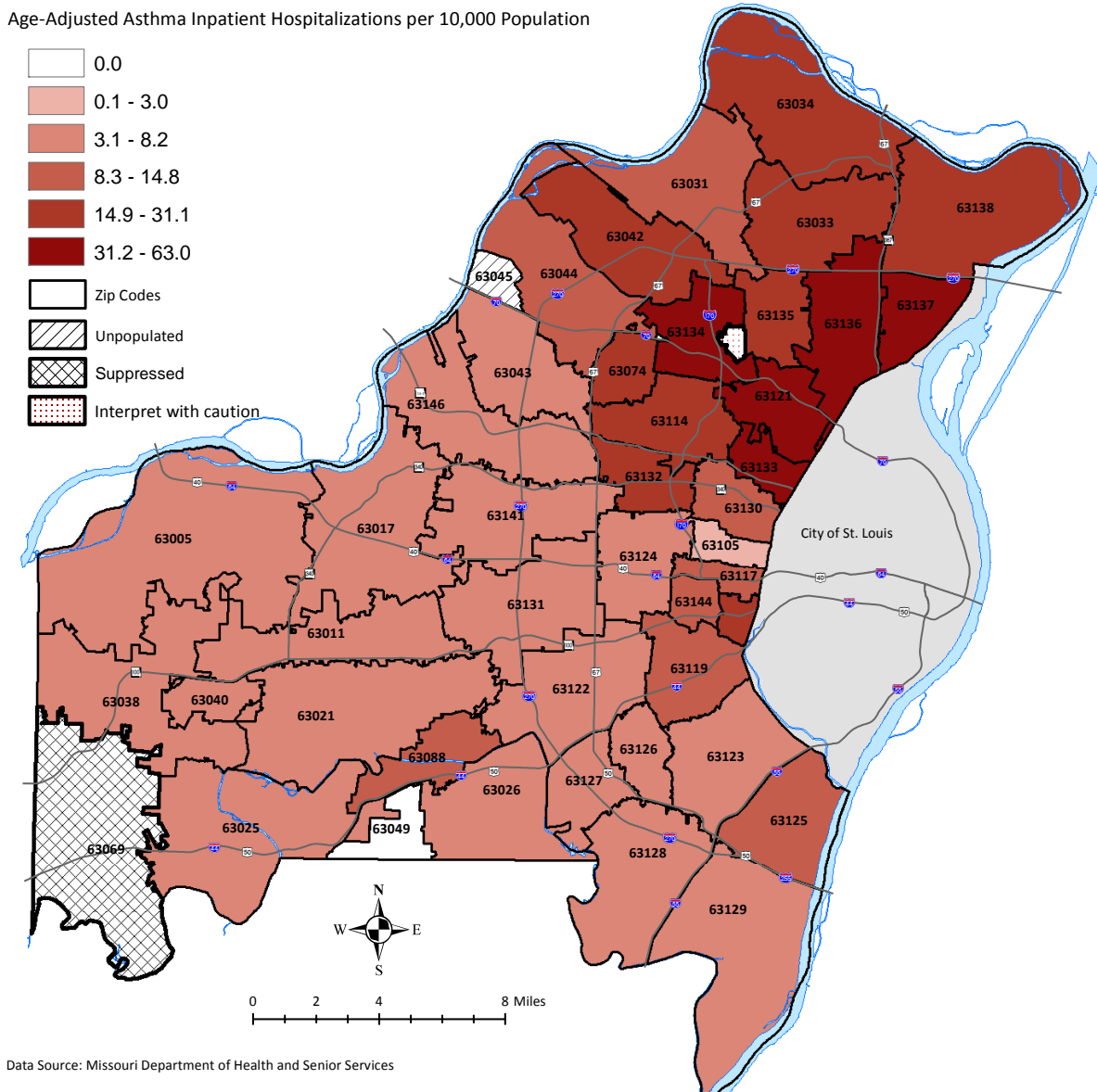
**Map 1-1. Asthma Hospitalization Rate by Geographic Area Comparison, St. Louis County, 2010-2014.**

A comparison of sub-county rates of hospitalizations for asthma to the overall county rate for 2010-2014 is displayed in **Map 1-1**. The Inner North rate was higher in comparison to the county rate, whereas the Central, West, and South areas had lower rates compared to the county overall. The Outer North rate of hospitalizations for asthma was not different from the county.



Data Source: Missouri Department of Health and Senior Services

**Map 1-2. Asthma Hospitalizations per 10,000 Population by Zip Code, St. Louis County, 2010-2014.**



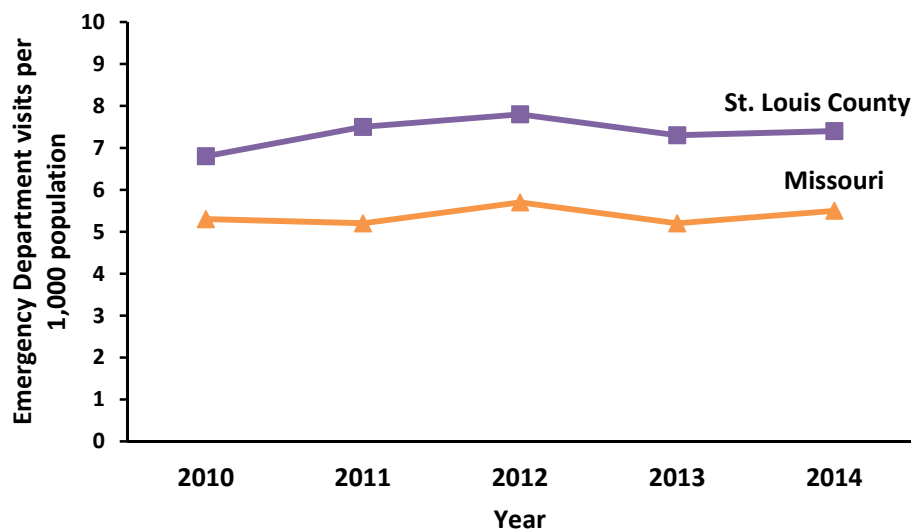
**Map 1-2** shows 2010-2014 rates of hospitalization for asthma by zip code in St. Louis County. The highest hospitalizations for asthma per population were in those areas in the Inner North, Outer North, and Central sub-county areas that were in closest proximity to St. Louis City.

## Emergency Department Visits

Emergency department (ED) visits for asthma exacerbations are an indicator of poorly-controlled asthma and risk for subsequent asthma exacerbations.<sup>8</sup> The Guidelines for the Diagnosis and Management of Asthma (2007) recommend EDs provide patient education, including proper inhaler techniques, instructions for medications, and environmental control measures; as well as provide referrals to follow-up care. This section describes trends for ED visits with a principal diagnosis of *International Classification of Diseases, Ninth Revision* (ICD-9) code 493 among St. Louis County, Missouri residents from 2010 through 2014.<sup>9</sup> It is important to note that this indicator might overestimate the impact of asthma exacerbations because it represents the number of ED visits, as opposed to the *number of individuals* who have sought emergency care for asthma. When rates and 95% CIs are not specified in figures or text, they can be found in **Appendix 3**.

St. Louis County consistently had significantly higher rates of ED visits for asthma compared to Missouri (**Figure 13**). Furthermore, the county rates increased from 6.8 ED visits per 1,000 population (95% CI 6.7-7.0) in 2010 to 7.8 (95% CI 7.6-8.0) in 2012, and then decreased to 7.3 (95% CI 7.1-7.4) in 2013. Missouri rates increased from 5.3 ED visits per 1,000 population (95% CI 5.2 to 5.3) in 2010 to 5.7 (95% CI 5.7 to 5.8) in 2012, decreased in 2013, and then increased to 5.5 (95% CI 5.4 to 5.5) in 2014.

**Figure 13. Age-Adjusted Rates of Emergency Department (ED) Visits for Asthma, St. Louis County and Missouri, 2010-2014**



Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination. MICA, Emergency Room.

**Table 3** shows that the age-adjusted ED visit rate for asthma during 2010-2014 was 7.2 per 1,000 population in St. Louis County. The demographic groups that had significantly higher ED visit rates for asthma as compared with the county were: persons younger than 18 years (15.6, 95% CI 15.4-15.8), adults aged 18-24 years (8.9 95% CI 8.6-9.6), Blacks/African Americans (20.2, 95% CI 19.9-20.4), persons who lived in medium to very high poverty-level neighborhoods (8.2, 95% CI 8.0-8.4; 17.1 95% CI 16.7-17.4; 18.3, 95% CI 17.8-18.8, respectively), and persons who lived in Inner North (16.9, 95% CI 16.6-17.4) and Outer North (8.1, 95% CI 7.9-8.2). Except for males, all other groups not previously mentioned had ED visit rates that were lower than the county.

**Table 3. Asthma ED Visits per 1,000 Population, St. Louis County, 2010-2014 Average.**

	Rate	95% Confidence Interval	Count per Year
<b>Missouri</b>	5.38	5.35 to 5.41	30,498
<b>St. Louis County</b>	7.2	7.1 to 7.3	6,477
<b>Age Group</b>			
< 18 years	15.6	15.4 to 15.8	3,559
18 – 24 years	8.9	8.6 to 9.2	780
25 – 44 years	5.6	5.5 to 5.8	1,381
45 – 64 years	2.2	2.1 to 2.3	617
65 years and over	0.9	0.8 to 1.0	140
<b>Gender</b>			
Male	7.4	7.3 to 7.5	3,280
Female	6.9	6.8 to 7.0	3,197
<b>Race/Ethnicity</b>			
Asian	0.7	0.5 to 0.8	22
Black/African American	20.2	19.9 to 20.4	4,857
Hispanic or Latino	2.8	2.5 to 3.0	84
Multiple	1.1	1.0 to 1.3	49
White	2.4	2.3 to 2.5	1,400
<b>Neighborhood Poverty</b>			
Very High	18.3	17.8 to 18.8	1,047
High	17.1	16.7 to 17.4	1,980
Medium	8.2	8.0 to 8.4	1,757
Low	3.3	3.2 to 3.4	1,693
<b>Geographic Area</b>			
Central	4.2	4.0 to 4.4	482
Inner North	16.9	16.6 to 17.1	3,074
Outer North	8.1	7.9 to 8.2	1,905
South	3.2	3.1 to 3.3	547
West	1.8	1.7 to 1.9	470

**Comparisons:**

- Higher than St. Louis County rate
- Lower than St. Louis County rate

**Notes:**

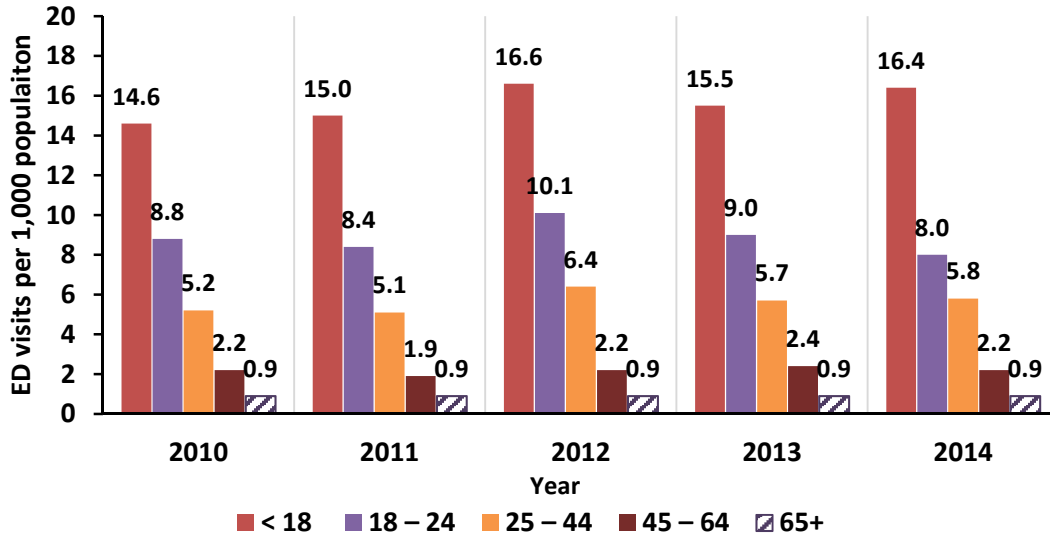
Sources: MICA, Emergency Room data. Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

Case Definition: International Classification of Diseases, Ninth Revision (ICD-9) code 493.

Rates are age-adjusted to the 2000 US population (not including Age Group rates).

Figure 14 shows the trend in ED visit rates for asthma decreased significantly as age increased. County residents aged less than 18 years had the highest burden of ED visits for asthma. The highest rate among persons less than 18 years old was in 2012—16.6 ED visits per 1,000 population (95% CI 16.1-17.1). Also, in 2012, ED visit rates peaked for adults aged 18-24 years (10.1, 95% CI 9.5-10.8) and 25-44 years (6.4, 95% CI 6.1-6.7). There was a significant increase in ED visit rate for asthma among adults aged 45-64 years from 2011 (1.9, 95% CI 1.7-2.0) to 2013 (2.4, 95% CI 2.2-2.6).

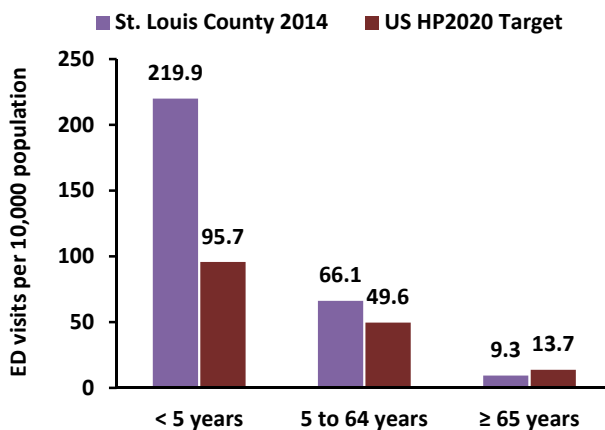
Figure 14. Age-Adjusted Rates of ED Visits for Asthma by Selected Age Groups, St. Louis County, 2010-2014



Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

### U.S. Healthy People 2020 Objective: Reduce emergency department (ED) visits for asthma

Figure 17. Crude ED Visit Rates for St. Louis County, 2014, Compared to Healthy People 2020 Targets

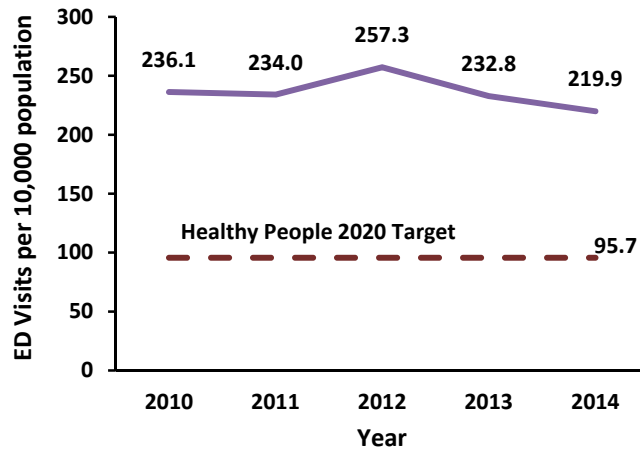


Young children in St. Louis County have the greatest burden of ED visits for asthma. In 2014, the ED visit rate for asthma among children less than 5 years old (219.9) was over two times the HP 2020 target of 95.7 per 10,000 population.<sup>6</sup> The St. Louis County ED visit rate for asthma among those aged 5 to 64 years (66.1) was almost one and a half times the HP 2020 target of 49.6 per 10,000 population.<sup>6</sup>

Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination and HealthyPeople.gov. Data are crude mortality rates.

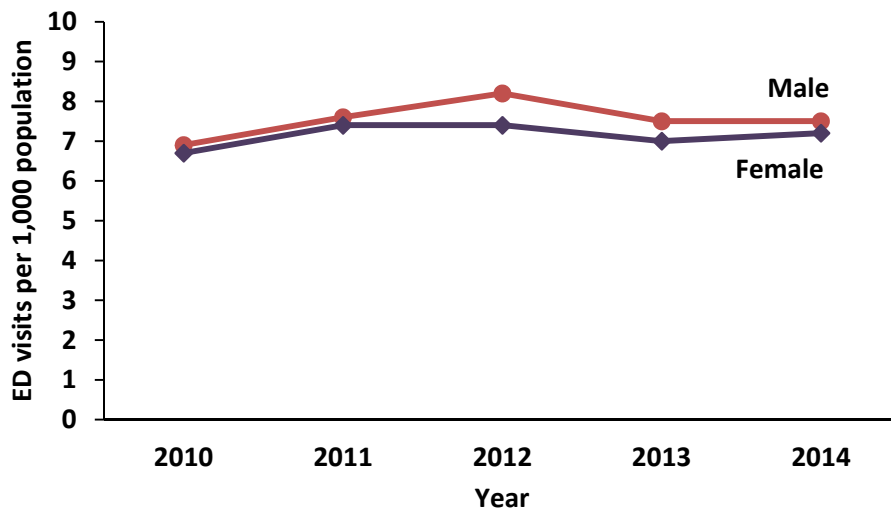
**Figure 18. Age-Specific Asthma ED Visits for Children Aged <5 Years, St. Louis County, 2010-2014, and Healthy People 2020 Target Rate**

**Figure 18** describes the trend in ED visit rates for asthma among children under age 5 in St. Louis County. The rate decreased significantly from 257.3 ED visits among children under 5 years per 10,000 in 2012 (95% CI: 244.3-270.6) to 219.9 in 2014 (95% CI: 208.0-232.1). The ED visit rate for asthma among children under age 5 was, on average, 236 visits per 10,000 population—about two and a half times the HP 2020 target rate (95.7).



Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination and HealthyPeople.gov.  
Data are crude mortality rates.

**Figure 15. Age-Adjusted Rates of ED Visits for Asthma by Sex, St. Louis County, 2010-2014**

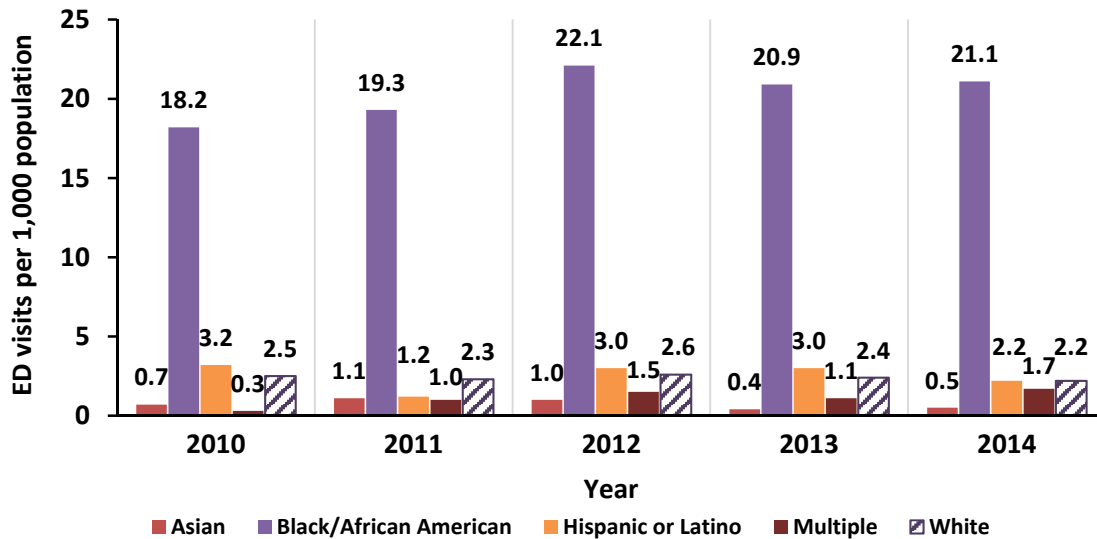


Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

**Figure 15** shows trends in ED visit rates for asthma for male and female St. Louis County residents. Males and females had similar rates of ED visits for asthma during 2010–2014. Rates for males and females increased from 2010 to 2011, 6.9 to 7.6 and 6.7 to 7.4, respectively. However, in 2012, the rate of ED visits among males was significantly higher than females, 8.2 visits per 1,000 population (95% CI 7.9-8.4) compared to 7.4 (95% CI 7.1-7.6), respectively.

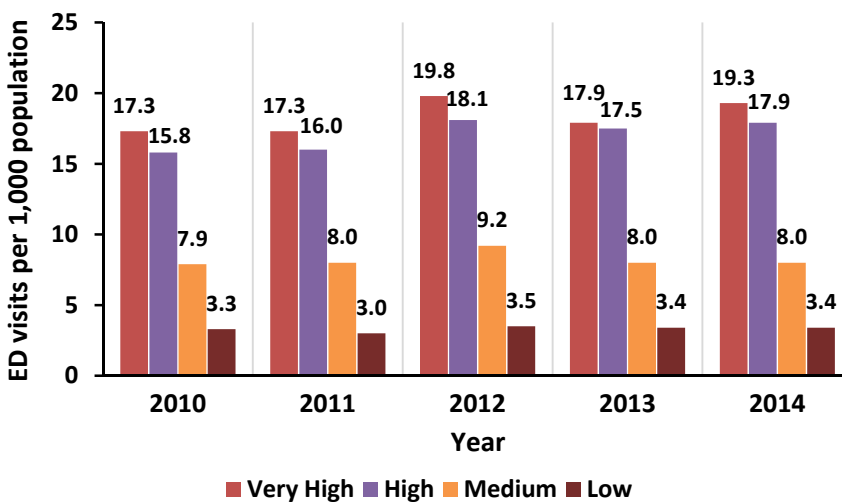
Blacks/African Americans had the highest burden of ED visits for asthma, having substantially higher rates as compared to all other race and ethnic groups (Figure 16). The disparity between Black/African American and White ED visit rates for asthma increased from 2010 to 2014. Moreover, from 2010 to 2014, ED visit rates for asthma among Blacks/African Americans significantly increased (18.2, 95% CI 17.7-18.7 to 21.1, 95% CI 20.5-21.7), while the rates among Whites significantly decreased (2.5, 95% CI 2.4-2.7 to 2.2, 95% CI 2.0-2.3). Hispanics or Latinos had similar ED visit rates as Whites, on average, for 2010-2014, 2.8 visits per 1,000 population (95% CI 2.5-3.0) as compared to 2.4 (95% CI 2.3-2.5), respectively. Asians and persons who identify with multiple races had the lowest ED visit rates for asthma in St. Louis County.

**Figure 16. Age-Adjusted Rates of ED Visits for Asthma by Race and Ethnicity, St. Louis County, 2010-2014**



Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

**Figure 19. Age-Adjusted Rates of ED Visits for Asthma by Neighborhood Poverty Level, St. Louis County, 2010-2014**



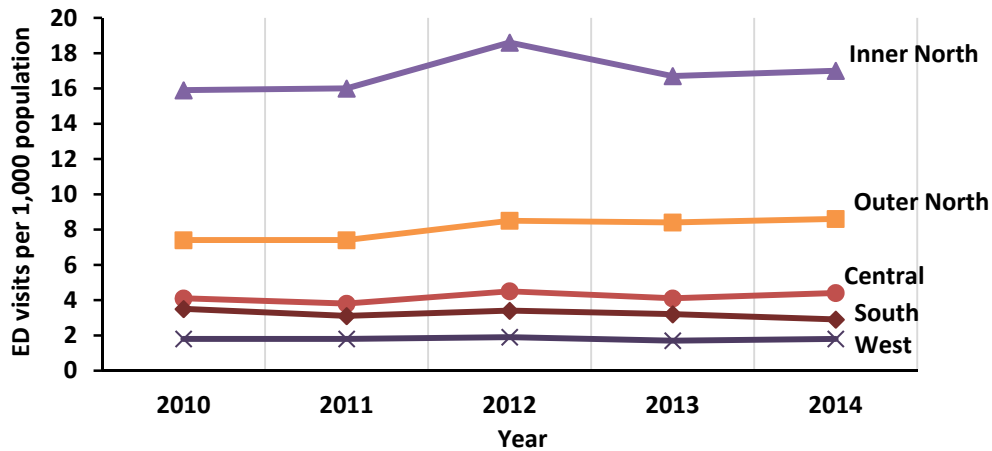
Source: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

Trends in ED visit rates for asthma by neighborhood poverty level are shown in Figure 19. Rates of ED visits for asthma decreased as neighborhood poverty decreased. The highest rates for all poverty levels were in 2012: 19.8 ED visits per 1,000 population (95% CI 18.6-21.0) for very high, 18.1 (95% CI 17.3-18.9) for high, 9.2 (95% CI 8.8-9.7) for medium, and 3.5 (95% CI 3.3-3.6) for low poverty level.



**Figure 20** shows that Inner North had the highest rates of ED visits for asthma during 2010-2014. The highest Inner North rate was in 2012 (18.6 ED visits per 1,000 population, 95% CI 17.9-19.2). Further, the Outer North area rate of ED visits for asthma significantly increased from 2011 (7.4, 95% CI 7.1-7.8) to 2012 (8.5, 95% CI 8.1-8.9). Central, South, and West sub-county geographic areas had stable rates of ED visits for asthma during 2010 to 2014. **Appendix 3** has more detailed comparisons for these rates.

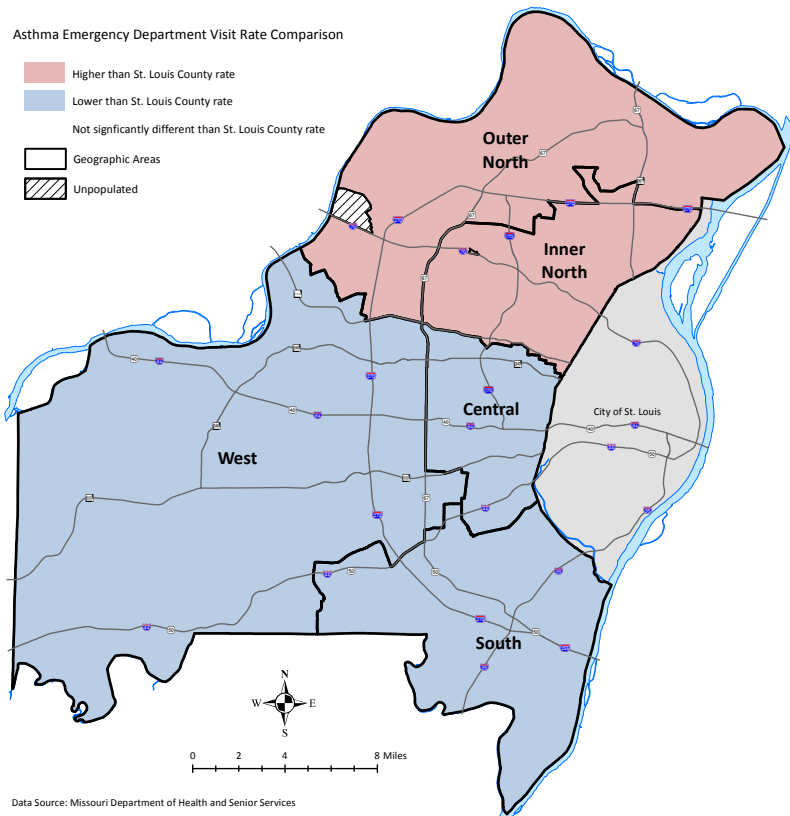
**Figure 20. Age-Adjusted Rates of ED Visits for Asthma by Sub-County Geographic Area, St. Louis County, 2010-2014**



Sources: Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

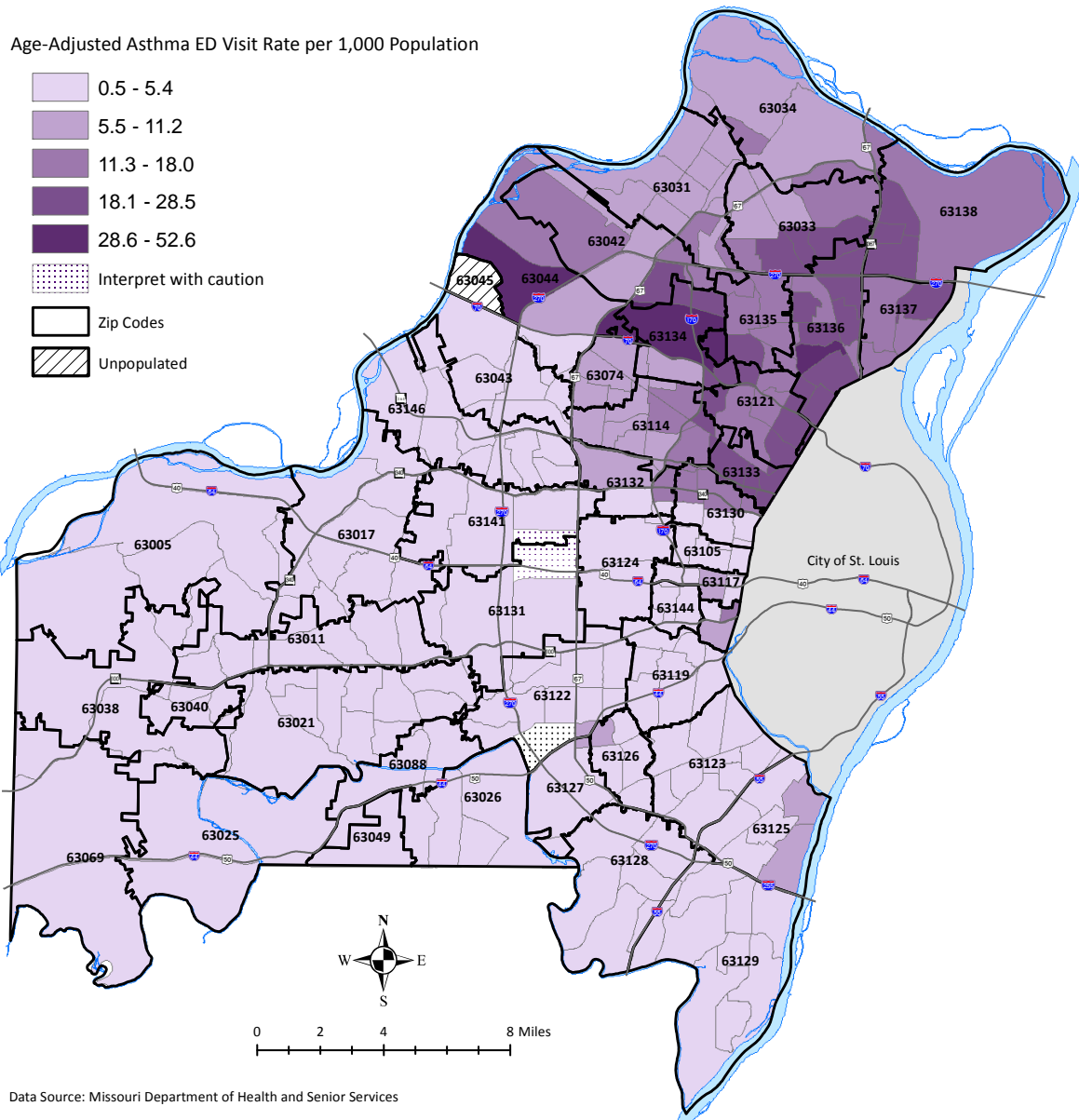
**Map 2-1. Asthma Emergency Department Visit Rate by Geographic Area Comparison, St. Louis County, 2010-2014.**

A comparison of sub-county rates of ED visits for asthma to the overall county rate for 2010-2014 is displayed in **Map 2-1**. The Inner North and Outer North rates were higher in comparison to the county rate. However, the Central, West, and South areas had lower rates compared to the overall county.



Data Source: Missouri Department of Health and Senior Services

**Map 2-2. Asthma Emergency Department Visits per 1,000 Population by Census Tract, St. Louis County, 2010-2014.**



**Map 2-2** shows 2010-2014 rates of ED visits for asthma by census tract in St. Louis County (zip codes are also labeled). The highest rates of ED visits for asthma per population were in areas in the Inner North and Outer North sub-county areas. There were census tracts within zip codes 63141, 63131, and 63122 that had very few ED visits for asthma (i.e., the precision standard was not met—relative standard error <30% and should be interpreted with caution).

## Risk Factors

Some common triggers of asthma symptoms include exposure to cigarette/tobacco smoke and air pollution. Exposure to tobacco smoke can increase the risk of developing asthma in children, trigger asthma symptoms (e.g., wheezing), and increase the severity of attacks.<sup>1, 2</sup> Outdoor air pollution and pollen can also trigger asthma symptoms. Controlling or avoiding triggers is important for controlling asthma.

**ADULTS WHO ARE CURRENTLY SMOKERS**

<b>St. Louis County</b>	<b>Missouri</b>	<b>United States</b>
<b>16%</b>	<b>24%</b>	<b>20%</b>

Source: 2012 CDC BRFSS<sup>5</sup>

### UNHEALTHY AIR QUALITY DAYS IN ST. LOUIS COUNTY (2012)

<b>Unhealthy for Sensitive Groups</b>	<b>Unhealthy</b>
<b>33</b>	<b>10</b>

Source: [EPA AirNow Historical Profile](#)

*Unhealthy for Sensitive Groups* = sensitive groups (asthma or other lung disease) may experience health effects. *Unhealthy* = everyone may begin to experience health effects—sensitive groups more severely.

## Methods

Data was obtained from the Missouri Department of Health and Senior Services, Bureau of Vital Statistics and the Bureau of Health Care Analysis and Data Dissemination for the years 2010–2014. Cause of death was classified using the *International Classification of Diseases, Tenth Revision (ICD-10)* underlying cause codes—Chronic Lower Respiratory Disease (CLRD) ICD-10 codes J40-J47 and Asthma ICD-10 codes J45-J46. Inpatient hospitalizations and ED visits were classified using *International Classification of Diseases, Ninth Revision (ICD-9)* primary diagnosis codes—Asthma ICD-9 code 493. Data for the United States death rates were obtained from National Vital Statistics Reports, from the National Vital Statistics System (NVSS), National Center for Health Statistics (NCHS).<sup>10</sup> Data for Missouri hospitalizations and ED visits were obtained from Missouri Information for Community Assessment (MICA; <https://webapp01.dhss.mo.gov/MOPHIMS/MICAHome>). The MICA Inpatient Hospitalizations file does not include newborn records.

The data received captures all deaths (within or outside of St. Louis County), inpatient hospitalizations, and ED visits of St. Louis County residents. The American Community Survey (ACS) was used to generate 1-year and 5-year estimates for the St. Louis County population by age, gender, race, and Hispanic origin for 2010-2014. Population-based rates (calculated using the number of events—ED visits and hospitalizations—or deaths divided by the estimated population size for the same demographic group and year) reflect the overall burden on the general population. The percent of residents living below the federal poverty level for each census tract was also obtained from ACS using the 5-year estimate for 2009-2013.

In the analysis, neighborhood poverty level was assigned to each death based on residence within each

St. Louis County 2010 census tract.<sup>11</sup> Each census tract was assigned one of four categories of percent below federal poverty level: Low (0 to < 10 percent); Medium (10 to <20 percent); High (20 to <30 percent); and Very high (30 to 100 percent). Age-adjusted and age-specific rates and 95% confidence intervals were calculated in Microsoft Excel using population estimates from ACS. The rates were age-adjusted to the 2000 U.S. population.<sup>12</sup> Geographic regions were determined from St. Louis County Planning division region maps by assigning each census tract a matching region. Maps were generated using ArcGIS for the vital statistics data for rates by zip code and geographic regions.

*Healthy People* is an initiative created by the U.S. Department of Health and Human Services to provide evidence-based, 10-year goals and objectives to improve the nation's health and well-being. Healthy People 2020 is the fourth Healthy People initiative; the first was *Healthy People 1990: Promoting Health/Preventing Disease: Objectives for the Nation*. Healthy People objectives were created—involving input from many individuals and organizations—to monitor the nation's progress and motivate change that will prevent further disease.

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## Resources

### Bridgeton Respiratory Study

In 2016, the Saint Louis County Department of Public Health conducted an epidemiologic study to assess respiratory health issues of residents living near the Bridgeton Landfill and areas with similar demographic characteristics. During face-to-face interviews, participants were asked about respiratory disease and breathing issues, respiratory symptoms, smoking status, and perceptions of environmental issues. The full report is available at:

<http://www.stlouisco.com/Community/News/Article/1490/Bridgeton-Respiratory-Health-Survey>

### Healthy Homes Community-Based Asthma Care

The Healthy Homes Program at DPH addresses multiple childhood diseases and injuries in the home, including environmental hazards like lead, allergens, asthma, carbon monoxide, home safety, pesticides, and radon. The program offers:

- Individual family consultation services on asthma management methods
- In-home environmental assessments
- Group training and education for parents/caregivers
- In-home assessments and resources to improve the home health environment

For more information, call: **314-615-5323**

E-mail: [HealthyHomes.DPH@stlouisco.com](mailto:HealthyHomes.DPH@stlouisco.com)

Visit: [www.KnowAsthmaSTL.com](http://www.KnowAsthmaSTL.com)

### Clinical Services

The Saint Louis County Department of Public Health runs a clinic for children with asthma once a month at the John C. Murphy Health Center in Berkeley.

The clinic provides many services for patients with asthma by a team that includes a doctor, a pharmacist, a nurse, and a social worker. The clinic works to help develop an asthma action plan for each child, address asthma triggers in the home, and work with a child's school nurse to make sure the child's asthma is well controlled at school.

If your child has asthma and you are interested in visiting the asthma clinic, please call: **314-615-0560**.

**Air Pollution Control Monitoring Program**

The Saint Louis County Department of Public Health (DPH) measures outdoor pollen and mold (aeroallergens) for St. Louis County. The daily pollen and mold count and Air Quality forecast can be found by calling **314-615-6825** or visiting:

<http://www.stlouisco.com/HealthandWellness/EnvironmentalServices/PollenandMoldCenter>.

For a fee, the Environmental Health Laboratory (EHL) provides tape lift testing for county residents. This test can be used to identify mold on indoor surfaces. For more information, call EHL at: **314-615-8324**.

**Missouri Tobacco Quitline**

The Missouri Tobacco Quitline is free to Missouri residents that want help to quit smoking or chewing. Both the toll-free number and the website will register you to talk to a trained quit coach. Live people answer Missouri's Quitline 24 hours a day, 7 days a week. The quit coach will help you plan your quit.

Call **1-800-QUIT-NOW** or visit: <https://www.quitnow.net/missouri/ProgramLookup/>

**Asthma and Allergy Foundation of America-St. Louis Chapter**

<http://aafastl.org/>

**Healthy Kids Express, St. Louis Children's Hospital**

<http://www.stlouischildrens.org/health-resources/advocacy-outreach/healthy-kids-express/healthy-kids-express-asthma-program>

**Asthma Friendly St. Louis**

Community Program: <http://asthmafriendlystlouis.org/about/>

Resource Guide (City of St. Louis Department of Health): <http://asthmafriendlystlouis.org/cms/wp-content/uploads/2011/12/Asthma-Resource-Guide-04302012.pdf>

**Asthma Ready Communities**

<http://asthmaready.org/>

**Missouri DHSS Asthma Program**

<http://health.mo.gov/living/healthcondiseases/chronic/asthma/>

**Missouri Department of Natural Resources, Air Pollution Control Program**

<http://dnr.mo.gov/env/apcp/>

**American Lung Association**

<http://www.lung.org/lung-health-and-diseases/lung-disease-lookup/asthma/>

**American College of Allergy, Asthma & Immunology**

<http://acaai.org/asthma>

**CDC Asthma**

<https://www.cdc.gov/asthma/>

**EPA Asthma**

<https://www.epa.gov/asthma>

## Suggested citation

Kret, JE, Dalidowitz Dame, L, Tutlam, NT. Asthma Profile, St. Louis County, Missouri. Chronic Disease Epidemiology (CDE) program profile, no 4. St. Louis County, MO: Department of Public Health. May 2017.

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## Chronic Disease Epidemiology Program

The Chronic Disease Epidemiology (CDE) program is responsible for the analysis, interpretation, and presentation of health data related to chronic diseases and their risk factors.

The CDE program supports the Saint Louis County Department of Public Health (DPH) by providing the following services:

- Developing study designs, questionnaires, and case definitions.
- Evaluating chronic disease programs.
- Locating or developing surveillance systems and analyzing epidemiologic data sets.
- Providing county, state, and national comparison data.
- Interpreting St. Louis County chronic disease and risk factor data.
- Conducting epidemiologic investigations and special studies of chronic diseases and chronic disease risk factors of public health importance.
- Monitoring St. Louis County chronic disease trends.
- Providing scientific advice and technical assistance to community groups and outside partners with respect to surveillance and other epidemiology data expertise.
- Publishing reports and web pages on chronic disease and risk factors.

For more information about the CDE program, please send an e-mail to:

[ChronicDisease.DOH@stlouisco.com](mailto:ChronicDisease.DOH@stlouisco.com)

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## References

- <sup>1</sup> National Institutes of Health, National Heart, Lung, and Blood Institute. What is Asthma? [Accessed online Oct 5, 2015]. URL: <http://www.nhlbi.nih.gov/health/health-topics/topics/asthma>
- <sup>2</sup> United States Environmental Protection Agency (EPA). Asthma Triggers: Gain Control Accessed online January 30, 2017 at: <https://www.epa.gov/asthma/asthma-triggers-gain-control>
- <sup>3</sup> Kret JE, Dalidowitz L, DeClue R. Leading Causes of Death Profile, St. Louis County Missouri. Chronic Disease Epidemiology (CDE) program profile, no 2. St. Louis County, MO: Department of Public Health. February 2016.
- <sup>4</sup> Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health. BRFSS & Selected Metropolitan Area Risk Trends (SMART) County Prevalence Data [online]. 2011 and 2012. Accessed Sep 29, 2016. URL: <https://chronicdata.cdc.gov/Behavioral-Risk-Factors/Behavioral-Risk-Factors-Selected-Metropolitan-Area/cpem-dkkm>
- <sup>5</sup> Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health. BRFSS Prevalence & Trends Data [online]. 2015. Accessed Sep 29, 2016. URL: <http://www.cdc.gov/brfss/brfssprevalence/>.
- <sup>6</sup> Healthy People 2020 [Internet]. Washington, DC: U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion [cited October 14, 2016]. Available from: <https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases>
- <sup>7</sup> Moorman JE, Akinbami LJ, Bailey CM, et al. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics. Vital Health Stat 3(35). 2012.
- <sup>8</sup> U.S. Department of Health and Human Services (HHS). Expert panel report 3: Guidelines for the diagnosis and management of asthma. Bethesda, MD: HHS, National Heart Lung, and Blood Institute, National Institutes of Health. Publication No. 07-4051. 2007.
- <sup>9</sup> Holt JB, Huston SL, Heidari K, et al.; Centers for Disease Control and Prevention (CDC). Indicators for chronic disease surveillance - United States, 2013. MMWR Recomm Rep 2015; 64(No. RR-1):1–246. PMID: 25578080
- <sup>10</sup> Kochanek KD, Murphy SL, Xu JQ, Tejada-Vera B. Deaths: Final data for 2014. National vital statistics reports; vol 65 no 4. Hyattsville, MD: National Center for Health Statistics. 2016. (Table 9, Table 16)
- <sup>11</sup> Toprani A, Hadler JL. Selecting and Applying a Standard Area-based Socioeconomic Status Measure for Public Health Data: Analysis for New York City. New York City Department of Health and Mental Hygiene: Epi Research Report, May 2013; 1-11.
- <sup>12</sup> Klein RJ, Schoenborn CA. Age adjustment using 2000 projected U.S. population. Healthy People Statistical Notes, no. 20. Hyattsville, Maryland: National Center for Health Statistics. January 2001.

## Appendix 1: Mortality

**Appendix 1.1.** Chronic Lower Respiratory Disease (CLRD) Deaths per 100,000 Population, United States, Missouri and St. Louis County, 2010-2014.

	2010			2011			2012			2013			2014		
	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count
<b>United States<sup>1</sup></b>	42.2			42.5			41.5			42.1			40.5		
<b>Missouri<sup>2</sup></b>	52.4	50.6 to 54.1	3,542	50.6	48.9 to 52.3	3,483	51.6	49.9 to 53.2	3,642	52.9	51.2 to 54.5	3,800	51.1	49.4 to 52.7	3,739
<b>St. Louis County<sup>3</sup></b>	30.2	27.2 to 33.5	385	32.0	28.9 to 35.3	408	34.1	30.9 to 37.4	447	33.4	30.2 to 36.7	437	33.4	30.3 to 36.7	443
<b>Age Group</b>															
< 18 years	0.4*	0.0 to 1.6	1	0.4*	0.0 to 1.6	1	0.9*	0.1 to 2.5	2	0.4*	0.0 to 1.6	1	0.4*	0.0 to 1.6	1
18 – 24 years	0.0	0.0 to 0.0	0	0.0	0.0 to 0.0	0	0.0	0.0 to 0.0	0	0.0	0.0 to 0.0	0	‡	‡	‡
25 – 44 years	1.2	0.3 to 3.0	3	1.2	0.3 to 3.0	3	2	0.7 to 4.2	5	1.6	0.4 to 3.6	4	2.9	1.1 to 5.3	7
45 – 64 years	13.3	9.4 to 17.9	38	11.2	7.6 to 15.4	32	17.3	12.8 to 22.5	49	17.8	13.2 to 23.0	50	16.8	12.3 to 21.9	47
65 years and over	229.1	205.5 to 254	343	246	221.7 to 271.7	372	248.8	224.8 to 274.1	391	236.9	213.8 to 261.3	382	233.6	210.8 to 257.5	385
<b>Gender</b>															
Male	32.7	27.8 to 38.2	161	33.2	28.2 to 38.6	167	39.2	33.9 to 45.1	204	35.2	30.2 to 40.7	183	35.3	30.3 to 40.9	180
Female	29.0	25.2 to 33.2	224	31.1	27.2 to 35.5	241	30.9	27.0 to 35.2	243	32.2	28.2 to 36.5	254	32.4	28.5 to 36.8	263
<b>Race/Ethnicity</b>															
Asian	‡	‡	‡	0.0	0.0 to 0.0	0	‡	‡	‡	‡	‡	‡	‡	‡	‡
Black/African American	18.9	12.5 to 26.4	33	29.0	21.1 to 38.3	51	27.6	19.5 to 37.1	48	27.0	19.5 to 36.0	48	30.1	22.8 to 38.7	61
Hispanic or Latino	‡	‡	‡	0.0	0.0 to 0.0	0	‡	‡	‡	‡	‡	‡	‡	‡	‡
Multiple	‡	‡	‡	0.0	0.0 to 0.0	0	‡	‡	‡	‡	‡	‡	‡	‡	‡
White	32.3	28.9 to 35.9	349	32.8	29.4 to 36.5	357	35.8	32.2 to 39.6	396	35.3	31.8 to 39.1	385	33.5	30.2 to 37.2	379
<b>Neighborhood Poverty</b>															
Very High	30.7	16.8 to 50.2	15	20.1	9.1 to 36.1	10	33.7	19.1 to 53.5	18	18.8	8.6 to 34.1	10	50.7	32.5 to 73.8	26
High	31.6	21.7 to 43.7	35	31.3	21.4 to 43.2	35	41.6	30.3 to 55.5	46	34.7	24.2 to 47.4	38	41.7	30.1 to 55.3	46
Medium	36.7	30.0 to 44.3	112	36.9	30.1 to 44.6	108	36.9	30.0 to 44.7	108	36.9	30.2 to 44.6	111	42.4	35.1 to 50.6	128
Low	26.9	23.4 to 30.7	223	30.7	27.0 to 34.8	255	32.5	28.7 to 36.7	275	33.9	30.0 to 38.2	278	28.9	25.3 to 32.8	243
<b>Geographic Area</b>															
Central	22.8	16.1 to 31.0	43	27.2	19.7 to 36.3	46	26.0	18.7 to 35.2	45	30.5	22.7 to 40.0	56	25.9	18.5 to 34.9	45
Inner North	27.1	19.9 to 35.6	51	34.5	26.1 to 44.0	63	46.3	36.5 to 57.2	84	35.2	26.8 to 45.0	64	46.7	37.1 to 57.7	87
Outer North	30.2	23.9 to 37.5	82	26.8	20.8 to 33.7	73	29.8	23.7 to 36.9	84	27.7	21.6 to 34.7	75	32.3	25.7 to 39.8	87
South	35.5	28.9 to 42.9	109	40.3	33.5 to 48.1	128	33.6	27.4 to 40.8	105	40.8	33.8 to 48.7	125	39.2	32.5 to 46.9	127
West	24.5	19.8 to 29.9	100	24	19.4 to 29.4	98	30.6	25.4 to 36.6	129	29	23.8 to 34.7	117	22.9	18.5 to 28.0	97

**Comparisons:**

- Higher than St. Louis County rate
- Lower than St. Louis County rate

**Notes:**

Sources: <sup>1</sup>Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS). <sup>2</sup>Missouri Information for Community Assessment (MICA), Death. <sup>3</sup>Missouri DHSS, Bureau of Vital Statistics.

Case Definition: International Classification of Diseases, Tenth Revision (ICD-10) codes J40-J47.

Rates are age-adjusted to the 2000 US population (not including Age Group rates).

\*Interpret with caution; too few cases to meet precision standard (relative standard error <30%). ‡ Rate suppressed to protect confidentiality or too few cases to report reliable rates.



**Appendix 1.2.** Asthma Deaths per 100,000 Population, United States, Missouri and St. Louis County, 2010-2014.

	2010			2011			2012			2013			2014		
	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count
<b>United States<sup>1</sup></b>	1.0	1.0 to 1.1	3,404	1.0	1.0 to 1.0	3,345	1.1	1.0 to 1.1	3,531	1.1	1.0 to 1.1	3,630	1.1	1.0 to 1.1	3,651
<b>Missouri<sup>2</sup></b>	1.2	0.9 to 1.5	75	0.8	0.6 to 1.0	49	1.2	0.9 to 1.5	74	0.8	0.6 to 1.0	51	1.3	1.0 to 1.6	85
<b>St. Louis County<sup>3</sup></b>	0.7*	0.3 to 1.4	7	0.9*	0.4 to 1.6	11	1.2*	0.5 to 2.0	11	0.9*	0.4 to 1.7	10	2.2	1.3 to 3.3	23
<b>Age Group</b>															
< 18 years	0.4*	0.0 to 1.6	1	0	0.0 to 0.0	0	0.9*	0.1 to 2.5	2	0.4*	0.0 to 2.1	1	0.4*	0.0 to 1.6	1
18 – 24 years	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0	‡	‡	‡
25 – 44 years	1.2	0.3 to 3.0	3	1.2	0.3 to 3.0	3	1.6	0.4 to 3.6	4	1.6	0.4 to 3.6	4	2.4	0.9 to 4.8	6
45 – 64 years	0	0.0 to 0.0	0	1.4	0.4 to 3.1	4	1.1	0.2 to 2.6	3	1.1	0.2 to 2.6	3	3.9	2.0 to 6.6	11
65 years and over	2	0.4 to 4.8	3	2.6	0.7 to 5.8	4	1.3	0.2 to 3.5	2	1.2	0.2 to 3.5	2	1.2	0.1 to 3.4	2
<b>Gender</b>															
Male	1.1*	0.3 to 2.6	5	1.1*	0.4 to 2.5	6	1.0*	0.3 to 2.3	5	1.3*	0.4 to 2.8	6	2.1*	0.9 to 3.8	10
Female	0.3*	0.0 to 1.2	2	0.7*	0.2 to 1.7	5	1.2*	0.4 to 2.7	6	0.6*	0.1 to 1.6	4	2.3	1.2 to 4.1	13
<b>Race/Ethnicity</b>															
Asian	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0
Black/African American	1.4*	0.2 to 3.9	3	2.3*	0.7 to 5.5	5	3.5*	1.4 to 6.8	8	2.7*	0.9 to 5.9	6	5.9	3.1 to 10.0	14
Hispanic or Latino	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0
Multiple	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0	0	0.0 to 0.0	0
White	0.4*	0.1 to 1.1	4	0.6*	0.2 to 1.4	6	0.4*	0.1 to 1.3	3	0.5*	0.1 to 1.2	4	1.1*	0.4 to 2.0	9
<b>Neighborhood Poverty</b>															
Very High	‡	‡	‡	0	0.0 to 0.0	0	‡	‡	‡	0	0.0 to 0.0	0	‡	‡	‡
High	1.2*	0.0 to 6.0	1	3.5*	0.8 to 8.8	4	3.4*	0.7 to 8.3	4	0	0.0 to 0.0	0	4.2*	1.2 to 9.7	5
Medium	0.6*	0.0 to 2.3	2	1.6*	0.4 to 3.7	5	0.9*	0.1 to 3.2	2	2.6*	1.0 to 5.5	7	3.2*	1.3 to 6.2	8
Low	0.4*	0.1 to 1.2	3	0.3*	0.0 to 1.2	2	0.5*	0.1 to 1.4	3	0.5*	0.1 to 1.3	3	1.1*	0.4 to 2.3	7
<b>Geographic Area</b>															
Central	0	0.0 to 0.0	0	0	0.0 to 0.0	0	1.0*	0.0 to 4.4	1	1.8*	0.3 to 5.2	3	0.5*	0.0 to 3.0	1
Inner North	1.3*	0.1 to 4.3	2	3.8*	1.5 to 7.9	7	2.7*	0.8 to 6.2	5	1.5*	0.2 to 4.3	3	6.3	3.2 to 10.7	12
Outer North	0.4*	0.0 to 2.2	1	0.3*	0.0 to 1.6	1	0.8*	0.0 to 2.5	2.5	1.1*	0.1 to 3.5	2	2.3*	0.8 to 5.0	6
South	0	0.0 to 0.0	0	0.3*	0.0 to 2.1	1	0.8*	0.0 to 2.7	2	1.0*	0.1 to 3.6	2	1.3*	0.1 to 4.1	2
West	1.1*	0.3 to 2.9	4	0.6*	0.0 to 2.4	2	0.4*	0.0 to 2.3	1	0	0.0 to 0.0	0	0.5*	0.0 to 1.8	2

**Comparisons:**

- Higher than St. Louis County rate (where precision standard met\*)
- Lower than St. Louis County rate (where precision standard met\*)

**Notes:**

Sources: <sup>1</sup>CDC, NCHS on CDC WONDER Online Database. <sup>2</sup>(MICA), Death. <sup>3</sup>Missouri Department of Health and Senior Services (DHSS), Bureau of Vital Statistics.

Case Definition: International Classification of Diseases, Tenth Revision (ICD-10) codes J45-J46.

Rates are age-adjusted to the 2000 US population (not including Age Group rates). CI = Confidence Interval.

\*Interpret with caution; too few cases to meet precision standard (relative standard error <30%). ‡Rate suppressed to protect confidentiality or too few cases to report reliable rates.

## Appendix 2: Hospitalizations

**Appendix 2.** Asthma Hospitalizations per 10,000 Population, Missouri and St. Louis County, 2010-2014.

	2010			2011			2012			2013			2014		
	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count
<b>Missouri<sup>1</sup></b>	13.4	13.1 to 13.7	8,044	12.4	12.1 to 12.7	7,483	12.0	11.7 to 12.3	7,228	10.8	10.5 to 11.1	6,525	11.5	11.3 to 11.8	6,933
<b>St. Louis County<sup>2</sup></b>	16.2	15.4 to 17.0	1,571	15.6	14.8 to 16.5	1,506	15.2	14.4 to 16.0	1,492	13.5	12.7 to 14.2	1,331	14.4	13.7 to 15.2	1,413
<b>Age Group</b>															
< 18 years	25.9	23.8 to 28.0	603	25.4	23.4 to 27.5	583	23.6	21.6 to 25.6	536	18.3	16.6 to 20.2	414	22.1	20.2 to 24.1	494
18 – 24 years	9.5	7.5 to 11.6	82	7.9	6.1 to 9.8	68	9.3	7.4 to 11.4	82	6.4	4.8 to 8.2	57	7.3	5.7 to 9.2	65
25 – 44 years	12.4	11.0 to 13.8	302	12.3	11.0 to 13.8	302	10.9	9.6 to 12.2	266	11.1	9.8 to 12.4	270	11.2	9.9 to 12.5	274
45 – 64 years	12.1	10.9 to 13.4	346	11.8	10.5 to 13.1	337	14.0	12.7 to 15.5	398	13.4	12.1 to 14.8	378	12.4	11.1 to 13.7	347
65 years and over	15.9	13.9 to 18.0	238	14.3	12.4 to 16.3	216	13.4	11.6 to 15.2	210	13.1	11.4 to 15.0	212	14.1	12.4 to 16.0	233
<b>Gender</b>															
Male	14.7	13.6 to 15.8	671	14.0	12.9 to 15.1	634	14.3	13.2 to 15.5	652	11.7	10.7 to 12.7	534	13.1	12.1 to 14.2	598
Female	17.1	16.0 to 18.3	900	16.7	15.6 to 17.9	872	15.5	14.5 to 16.7	840	14.8	13.7 to 15.9	797	15.2	14.2 to 16.4	815
<b>Race/Ethnicity</b>															
Asian	‡	‡	‡	3.0	1.3 to 5.7	9	3.6*	1.5 to 6.6	10	1.9*	0.6 to 4.3	6	2.6*	1.0 to 5.2	8
Black/African American	40.4	37.8 to 43.1	951	42.1	39.4 to 44.8	971	39.9	37.3 to 42.6	937	35.3	32.9 to 37.8	814	35.9	33.5 to 38.4	855
Hispanic or Latino	8.8	4.3 to 15.1	16	8.1	4.9 to 12.7	22	11.3	7.4 to 16.7	30	2.2*	0.8 to 4.8	7	5.2	2.4 to 9.7	14
Multiple	2.1*	0.8 to 4.9	8	‡	‡	‡	1.8*	0.5 to 6.5	6	2.3	1.2 to 5.0	13	4.2	1.8 to 8.1	15
White	8.1	7.5 to 8.9	573	6.8	6.2 to 7.4	483	7.0	6.4 to 7.7	507	6.5	5.9 to 7.2	475	7.1	6.4 to 7.7	508
<b>Neighborhood Poverty</b>															
Very High	41.1	35.7 to 46.8	228	44	38.6 to 50.0	244	41.1	35.8 to 46.9	224	36.9	31.8 to 42.4	199	36.8	31.7 to 42.3	199
High	33.8	30.5 to 37.4	387	34.2	30.8 to 37.7	389	36.0	32.6 to 39.7	413	28.4	25.4 to 31.7	323	30.7	27.5 to 34.1	357
Medium	19.6	17.8 to 21.6	437	19.5	17.7 to 21.5	440	16.5	14.8 to 18.3	380	15.3	13.7 to 17.0	355	17.6	15.9 to 19.5	406
Low	9.0	8.2 to 9.8	519	7.4	6.7 to 8.2	433	8.0	7.3 to 8.8	475	7.5	6.8 to 8.2	454	7.7	7.0 to 8.5	451
<b>Geographic Area</b>															
Central	14.2	12.1 to 16.5	173	12.8	10.8 to 15.0	157	11.4	9.5 to 13.5	143	10.3	8.6 to 12.3	131	10.1	8.3 to 12.1	123
Inner North	37.3	34.5 to 40.3	685	38.3	35.4 to 41.2	700	35.4	32.6 to 38.2	651	31.0	28.4 to 33.6	569	32.3	29.7 to 35.0	593
Outer North	13.9	12.4 to 15.4	337	14.6	13.1 to 16.2	353	15.2	13.7 to 16.9	374	13.9	12.4 to 15.5	342	14.5	13.0 to 16.1	356
South	8.9	7.6 to 10.4	179	7.1	5.9 to 8.4	142	8.4	7.1 to 9.8	173	7.2	6.0 to 8.5	152	7.5	6.3 to 8.8	155
West	6.6	5.7 to 7.6	197	5.0	4.2 to 5.9	154	4.9	4.1 to 5.8	151	4.3	3.5 to 5.1	137	6.1	5.2 to 7.1	186

**Comparisons:**

- Higher than St. Louis County rate
- Lower than St. Louis County rate

**Notes:**

Sources: <sup>1</sup>MICA, Inpatient Hospitalizations. <sup>2</sup>Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

Case Definition: International Classification of Diseases, Ninth Revision (ICD-9) code 493.

Rates are age-adjusted to the 2000 US population (not including Age Group rates). CI = Confidence Interval.

\*Interpret with caution; too few cases to meet precision standard (relative standard error <30%). ‡Rate suppressed to protect confidentiality or too few cases to report reliable rates.

## Appendix 3: Emergency Department Visits

**Appendix 3.** Asthma Emergency Department Visits per 1,000 Population, Missouri and St. Louis County, 2010-2014.

	2010			2011			2012			2013			2014		
	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count	Rate	95% CI	Count
<b>Missouri<sup>1</sup></b>	5.3	5.2 to 5.3	30,084	5.2	5.1 to 5.3	29,518	5.7	5.7 to 5.8	32,491	5.2	5.2 to 5.3	29,616	5.5	5.4 to 5.5	30,779
<b>St. Louis County<sup>2</sup></b>	6.8	6.7 to 7.0	6,199	7.5	7.4 to 7.7	6,107	7.8	7.6 to 8.0	6,983	7.3	7.1 to 7.4	6,518	7.4	7.1 to 7.6	6,580
<b>Age Group</b>															
< 18 years	14.6	14.1 to 15.1	3,406	15.0	14.5 to 15.5	3,452	16.6	16.1 to 17.1	3,768	15.5	15.0 to 16.0	3,502	16.4	14.6 to 15.5	3,668
18 – 24 years	8.8	8.2 to 9.5	766	8.4	7.8 to 9.0	723	10.1	9.5 to 10.8	894	9.0	8.4 to 9.7	804	8.0	7.4 to 8.6	711
25 – 44 years	5.2	4.9 to 5.4	1,259	5.1	4.9 to 5.4	1,260	6.4	6.1 to 6.7	1,571	5.7	5.4 to 6.0	1,394	5.8	5.5 to 6.1	1,422
45 – 64 years	2.2	2.0 to 2.4	632	1.9	1.7 to 2.0	540	2.2	2.0 to 2.3	614	2.4	2.2 to 2.6	675	2.2	2.1 to 2.4	625
65 years and over	0.9	0.8 to 1.1	136	0.9	0.7 to 1.0	132	0.9	0.7 to 1.0	136	0.9	0.7 to 1.0	143	0.9	0.8 to 1.1	154
<b>Gender</b>															
Male	6.9	6.6 to 7.1	3,089	7.6	7.3 to 7.9	3,132	8.2	7.9 to 8.4	3,594	7.5	7.2 to 7.8	3,303	7.5	7.3 to 7.8	3,284
Female	6.7	6.4 to 6.9	3,110	7.4	7.1 to 7.6	2,975	7.4	7.1 to 7.6	3,389	7.0	6.7 to 7.2	3,215	7.2	7.0 to 7.5	3,296
<b>Race/Ethnicity</b>															
Asian	0.7	0.4 to 1.0	21	1.1	0.8 to 1.6	27	1.0	0.6 to 1.4	30	0.4	0.2 to 0.7	14	0.5	0.3 to 0.8	17
Black/African American	18.2	17.7 to 18.7	4,477	19.3	18.8 to 19.9	4,504	22.1	21.5 to 22.7	5,274	20.9	20.3 to 21.5	4,912	21.1	20.5 to 21.7	5,119
Hispanic or Latino	3.2	2.5 to 4.1	80	1.2	0.9 to 1.7	81	3.0	2.3 to 3.7	89	3.0	2.4 to 3.7	93	2.2	2.1 to 2.8	78
Multiple	0.3	0.2 to 0.7	13	1.0	0.7 to 1.9	42	1.5	1.1 to 2.2	64	1.1	0.8 to 1.5	57	1.7	1.3 to 2.2	70
White	2.5	2.4 to 2.7	1,516	2.3	2.2 to 2.5	1,390	2.6	2.5 to 2.7	1,468	2.4	2.2 to 2.5	1,381	2.2	2.0 to 2.3	1,245
<b>Neighborhood Poverty</b>															
Very High	17.3	16.3 to 18.5	999	17.3	16.3 to 18.5	992	19.8	18.6 to 21.0	1,119	17.9	16.8 to 19.0	1,024	19.3	18.2 to 20.5	1,099
High	15.8	15.1 to 16.6	1,850	16	15.2 to 16.7	1,856	18.1	17.3 to 18.9	2,105	17.5	16.7 to 18.3	2,029	17.9	17.1 to 18.7	2,062
Medium	7.9	7.5 to 8.3	1,678	8.0	7.6 to 8.4	1,702	9.2	8.8 to 9.7	1,985	8.0	7.7 to 8.4	1,726	8.0	7.6 to 8.4	1,695
Low	3.3	3.1 to 3.4	1,672	3.0	2.9 to 3.2	1,557	3.5	3.3 to 3.6	1,774	3.4	3.2 to 3.5	1,739	3.4	3.2 to 3.5	1,724
<b>Geographic Area</b>															
Central	4.1	3.7 to 4.4	461	3.8	3.5 to 4.2	436	4.5	4.2 to 5.0	526	4.1	3.7 to 4.5	480	4.4	4.0 to 4.8	507
Inner North	15.9	15.4 to 16.5	2,917	16	15.5 to 16.6	2,931	18.6	17.9 to 19.2	3,378	16.7	16.2 to 17.4	3,054	17	16.4 to 17.7	3,088
Outer North	7.4	7.0 to 7.7	1,743	7.4	7.1 to 7.8	1,752	8.5	8.1 to 8.9	2,013	8.4	8.0 to 8.8	1,990	8.6	8.2 to 9.0	2,026
South	3.5	3.2 to 3.8	593	3.1	2.8 to 3.4	524	3.4	3.1 to 3.7	573	3.2	2.9 to 3.4	545	2.9	2.7 to 3.2	498
West	1.8	1.7 to 2.0	485	1.8	1.6 to 1.9	464	1.9	1.7 to 2.1	493	1.7	1.5 to 1.8	449	1.8	1.6 to 1.9	461

### Comparisons:

  Higher than St. Louis County rate

  Lower than St. Louis County rate

### Notes:

Sources: <sup>1</sup>MICA, Emergency Room. <sup>2</sup>Missouri DHSS, Bureau of Health Care Analysis and Data Dissemination.

Case Definition: International Classification of Diseases, Ninth Revision (ICD-9) code 493.

Rates are age-adjusted to the 2000 US population (not including Age Group rates). CI = Confidence Interval.