**Asthma-Related Emergency Department Visits**

**in Massachusetts**

**Background and Purpose:** Asthma is one of the most common chronic diseases in the United States.[[1]](#endnote-1) Asthma affects people of all ages and is a significant public health problem, with visits to the Emergency Department (ED) sometimes being necessary in response to asthma attacks. However, asthma is a condition that is largely controllable with appropriate management, and the need for ED visits can be considered preventable, if patients and their families are adequately educated about the disease, have access to high quality health care, and practice appropriate asthma management.[[2]](#endnote-2) Since 2006, the United States Department of Health and Human Service has identified a reduction in ED visits for asthma as a national public health objective.[[3]](#endnote-3) According to a recent national survey, asthma accounts for 1.7 million visits to the emergency department annually, making it one of the top 20 reasons for ED visits.[[4]](#endnote-4) It is important to seek medical care right away if a person or their child has trouble breathing; however, unnecessary trips to the ED can be costly. On average, every asthma-related trip to the ED costs $1,502.[[5]](#endnote-5)

Asthma management is dependent on being able to minimize exposure to asthma triggers in the environment, to understand and take medications as prescribed, and to recognize the signs of asthma and know what to do if asthma gets worse. Social determinants of health play an important role in asthma outcomes. Exposures and conditions where people live, work, learn or play can affect their asthma. Low levels of environmental pollution, quality living conditions, education and linguistic competency, access to quality medical care and information are necessary to support adequate asthma management. Given that these necessary conditions are not equitably distributed, it is not surprising that there are also dramatic inequities in people’s ability to successfully manage their asthma. In fact, although the percent of adults who have ever been told by a health care provider that they have asthma does not differ significantly by race/ethnicity in Massachusetts, there are stark racial/ethnic disparities in ED visits and hospitalizations.[[6]](#endnote-6)

**What is Asthma:** Asthma is a chronic inflammation of the airways. Airways become constricted with swelling and excessive mucous production, making it difficult to breathe. Symptoms of asthma are wheezing, coughing, chest tightness, and nighttime or early morning coughing. It can have a significant effect on a person’s quality of life. Sometimes the symptoms become so severe that they result in an asthma attack that requires immediate medical treatment. Asthma affects individuals differently, resulting in differing severity, presentation of symptoms, and responsiveness to treatment. When not treated, asthma can cause disability and even death. Asthma control status varies by age, gender, race/ethnicity, and socioeconomic status. Increasing rates of hospital treatment due to asthma may indicate increasing prevalence or severity within the population.

Asthma is largely controllable with appropriate primary and ongoing asthma management. If patients and their families are adequately educated about the disease, and have access to high quality health care, the need for hospitalization can usually be prevented. However, differences in rates of hospitalization for asthma suggest that there is significant room for improvement in caring for the condition.

**Content:** The content of this report includes:

* State-wide trends of asthma-related ED visits and inequities by gender, age, race, and geography.
* Costs associated with asthma-related ED visits.

In this brief, a statewide data source is used to describe asthma-related ED visits in Massachusetts – the Emergency Department Visits Discharge Database managed by the Center for Health Information and Analysis (CHIA). The data includes patient demographics, admission and discharge information, diagnostic and procedural coding, provider details, and detailed charge information. Findings for asthma-related ED visits begin with a time trend using all years of data available. These data are followed by a more detailed examination of trends over time from 2002 onward. Cross sectional findings are based on the most recent data available and in most instances multiple years of data are aggregated to derive more stable estimates where possible.

At-risk based rates for asthma-related ED visits were calculated to assess the rate of ED visits among the Massachusetts population with current asthma.[[7]](#endnote-7) The Massachusetts Behavioral Risk Factor Surveillance System (BRFSS) from 2007-2018 are used to calculate these at-risk rates, which provide additional understanding of changes over time in different hospital services during a period of increasing prevalence.

This brief also includes data on hospital charges for asthma-related ED visits. In interpreting these findings on charges, readers should be aware of several data considerations. First, the charges for service are not reflective of the actual cost of care, nor are they reflective of what was reimbursed to the hospital by the payer. Second, some of the charges do not include costs associated with the long-term effects of asthma, such as lost time from work and household duties or reduced quality of life. Asthma related hospitalization will be reported separately.

**Definitions:**

***Diagnosis Code*:** The International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) is a morbidity classification published by the United States National Center for Health Statistics (NCHS) for classifying diagnoses and reason for visits in all health care settings. The ICD-10-CM is based on the ICD-10, the statistical classification of disease published by the World Health Organization (WHO).The transition from ICD-9-CM to ICD-10-CM occurred on October 1, 2015. The ICD-CM codes for asthma have changed from 493.00 – 493.99 in ICD-9-CM to J45.0 – J45.998 in ICD-10-CM. A few codes covered under the ICD-9-CM asthma codes 493.00-493.99 are not covered under asthma’s J45 codes in ICD-10-CM. Under ICD-10-CM, co-morbidities are typically coded separately.

***Note: In tables and figures below, estimates based on ICD-9-CM and ICD-10-CM are separated by a dashed line.*** ***Due to the use of the new ICD-CM code, data from 2015 on cannot be aggregated with years prior to 2015 for analysis. Findings are compared to national estimates where possible.***

***Data Definitions:***

|  |
| --- |
| **Crude rate:** A rate that represents the actual number of events due to asthma per 10,000 residents over a given time period.  **Age-adjusted rate:** A summary rate (per 10,000 residents) calculated by weighting age-specific event rates for a given year to the 2010 US standard population in order to minimize the effect of different age distributions in populations when comparing rates.  **Age-specific rate:** A rate (per 10,000 residents) estimated as the number of events due to asthma in a specified age group per total residents within that age group for a particular time period.  **At-risk rate:** Calculated as the number of events (eg. ED visits) due to asthma among adults with current asthma at that time. This rate (per 100 at-risk residents) can be used to determine if the changes over time may be explained by the increase in asthma prevalence. |

**Burden in Asthma-Related Emergency Department Visits**

The data below is presented for asthma-related ED visits in Massachusetts. ED visits are defined as any visit by a patient who is registered at the ED but the visit does not result in an outpatient observation stay or the inpatient admission of the patient at the reporting facility, and where the only service to a registered patient is triage or screening.[[8]](#endnote-8) An asthma-related ED visit is one where the primary discharge diagnosis ICD10 code J45 is for asthma. ED visit statistics are calculated from the statewide Emergency Department Visits Discharge Database which provides data reported quarterly from hospitals to the Massachusetts Center for Health Information and Analysis. Worth noting, all trend analyses presented in the report did not include data from 2015 and the following years due to ICD code conversion.

As shown in Figure 1 below, the age-adjusted rate of asthma-related ED visits in Massachusetts remained fairly consistent with the national rate. However, statistical significance could not be determined because confidence intervals were not provided for national estimates.

**Figure 1. Age-Adjusted Rates of Asthma-Related Emergency Department (ED) Visits, Massachusetts and United States Residents, 2002-2018**

From 2002 through 2018, there were 499,000 asthma-related ED visits among Massachusetts residents. This means that on average, during this time, there were about 96 ED visits for asthma each day in Massachusetts.

* In Massachusetts, from 2002 through 2014, the rate of asthma-related ED visits decreased 7.6% from 60.2 to 55.6 ED visits per 10,000 residents (Figure 2).
* From 2007 through 2014, the at-risk rate of asthma-related ED visits slightly decreased but it was not significant.

**Figure 2. Number and Age-Adjusted Rates of Asthma-Related Emergency Department (ED) Visits, Massachusetts Residents, 2002-2018**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Massachusetts** | | | | | **US** |  |
| **Year** | **No.** | **Crude Rate1** | **Age -Adjusted Rate1,2** | **95% CI3** | **At-Risk Rate4** | **Age-Adjusted Rate1,2** |  |
| 2002 | 38,013 | 59.1 | 60.2 | 59.6 - 60.8 | NA | 67.9 |  |
| 2003 | 40,155 | 62.3 | 63.9 | 63.2 - 64.5 | NA | 61.6 |  |
| 2004 | 35,335 | 54.9 | 56.4 | 55.8 - 57.0 | NA | 64.0 |  |
| 2005 | 36,102 | 56.1 | 57.7 | 57.1 - 58.3 | NA | 61.7 |  |
| 2006 | 37,021 | 57.5 | 59.6 | 59.0 - 60.3 | NA | 55.3 |  |
| 2007 | 35,359 | 54.8 | 57.2 | 56.6 - 57.8 | 5.6 | 59.6 |  |
| 2008 | 37,874 | 58.3 | 61.0 | 60.4 - 61.6 | 6.2 | 64.5 |  |
| 2009 | 36,460 | 55.3 | 58.0 | 57.4 - 58.6 | 5.4 | 69.7 |  |
| 2010 | 33,445 | 51.1 | 54.2 | 53.6 - 54.8 | 5.1 | 57.8 |  |
| 2011 | 34,839 | 52.9 | 56.3 | 55.7 - 56.9 | 4.9 | 58.1 |  |
| 2012 | 35,803 | 54.7 | 57.5 | 56.9 - 58.1 | 5.1 | 54.9 |  |
| 2013 | 33,831 | 51.7 | 54.3 | 53.7 - 54.9 | 4.8 | 52.5 |  |
| 2014 | 34,592 | 52.8 | 55.6 | 55.0 - 56.2 | 4.5 | 64.5 |  |
| 2015 | 35,039 | 53.5 | 56.0 | 55.4 - 56.6 | 5.0 | 55.0 |  |
| 2016 | 32,834 | 50.1 | 52.9 | 52.3 - 53.5 | 4.8 | 55.9 |  |
| 2017 | 31,307 | 47.8 | 50.3 | 49.8 - 50.9 | 3.8 | 49.1 |  |
| 2018 | 30,780 | 47.0 | 49.4 | 48.8 - 49.9 | 4.8 |  |  |
| **Trend Analysis5** | **Slope6** | | **95% CI3** | | |  |  |
| -0.47 | | -0.79 – - 0.15 | | |  |  |
| **P-Value7** | | | | |  |  |
| 0.01 | | | | |  |  |

1. Rate of asthma-related emergency department visits per 10,000 residents.

2. Age-adjusted to US 2010 population.

3. 95% confidence interval.

4. At-risk rate of emergency department visits per 100 residents

5.Trend analysis was performed using 2002-2014 data only due to ICD-9-CM diagnosis code having been changed to ICD-10-CM diagnosis code in October 2015 and after.

6.Slope (slope of the best line of fit calculated using JoinPoint Software) = the average age-adjusted rate increase or decrease per year (e.g. a slope of 1.0 indicates that the age-adjusted rate increased on average one per 10,000 residents per year).

7. P-value < 0.05 is considered statistically significant because it means that there is at most a 5% chance of observing a trend, given that, in reality, rates are stable.

NA= Data was not available.

Data Sources: CY2002-2018 Massachusetts Emergency Department Discharge Database, Massachusetts Center

for Health Information and Analysis;

CY2007-2018 Massachusetts BRFSS, Massachusetts Department of Public Health;

US Data: CY2002-2009 National Ambulatory Medical Care Survey, National Center for Health Statistics, [www.cdc.gov/nchs/data/series/sr\_03/sr03\_035.pdf](http://www.cdc.gov/nchs/data/series/sr_03/sr03_035.pdf), <https://www.cdc.gov/asthma/healthcare-use/2010/table_a.html> - <https://www.cdc.gov/asthma/healthcare-use/2017/table_a.html>.

***Charges of Asthma-Related ED Visit***

The combined total charges for asthma-related ED visits in Massachusetts from 2002 through 2018 were over $780 million. This was an average of $45.9 million per year.

* During this time period, the total charges increased 156% from $25.0 million in 2002 to $56.6 million in 2018 (unadjusted for inflation) (Figure 3).
* Mean charges per visit increased 219% from $654 to $2,085.
* Median charges per visit increased 208% from $553 to $1,702.

**Figure 3. Total Charges for Emergency Department (ED) Visits due to Asthma, Massachusetts Residents, 2002-2018**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Total Charges** | **Mean Charges** | | **Median Charges** |
| 2002 | $25,032,253 | $654 | | $553 |
| 2003 | $30,504,730 | $760 | | $659 |
| 2004 | $29,558,826 | $837 | | $724 |
| 2005 | $34,037,697 | $942 | | $828 |
| 2006 | $38,291,327 | $1,044 | | $921 |
| 2007 | $39,866,884 | $1,136 | | $989 |
| 2008 | $46,607,167 | $1,231 | | $1,076 |
| 2009 | $47,262,965 | $1,294 | | $1,128 |
| 2010 | $44,972,249 | $1,345 | | $1,180 |
| 2011 | $48,363,941 | $1,388 | | $1,209 |
| 2012 | $51,371,766 | $1,435 | | $1,252 |
| 2013 | $51,091,963 | $1,510 | | $1,298 |
| 2014 | $53,818,533 | $1,555 | | $1,352 |
| 2015 | $56,667,210 | $1,617 | | $1,358 |
| 2016 | $58,624,776 | $1,785 | | $1,521 |
| 2017 | $59,957,814 | $1,915 | | $1,612 |
| 2018 | $64,174,712 | $2,085 | | $1,702 |
| **Trend Analysis1** | **Slope2** | | **95% CI3** | |
| 2.35 | | 1.99 - 2.71 | |
| **P-Value4** | | | |
| < 0.01 | | | |

1. Trend analysis was performed using only 2002-2014 data due to ICD-9-CM diagnosis code having been changed to ICD-10-CM diagnosis code in October 2015 and after.

2. Slope (slope of the best line of fit calculated using JoinPoint Software) = the average millions of total charges increase or decrease per year (e.g. a slope of 1.0 indicates that the 1 million of total charges increased on average per year).

3. 95% Confidence Interval.

4. P-value < 0.05 is considered statistically significant because it means that there is at most a 5% chance of observing a trend, given that, in reality, total charges are stable.

Data Source: MA Data: CY2002-2018 Massachusetts Emergency Department Discharge Database, Massachusetts Center for Health Information and Analysis.

**Disparities Exist in Asthma Related Emergency Department (ED) Visits**

***By Race/Ethnicity***

* From 2002 through 2018, Black, Non-Hispanic, and Hispanic residents consistently had substantially higher age-adjusted rates of asthma-related ED visits than those who were White, Non-Hispanic (Figure 4).
* For each year examined, the highest rate of asthma-related ED visits was among Black, Non-Hispanic residents.
* During this time, Asian, Non-Hispanic residents including Pacific Islanders consistently had lower age-adjusted rates of asthma-related ED visits than White, Non-Hispanic residents.
* Moreover, age-adjusted rates of asthma-related ED visits were significantly decreased among White, Non-Hispanic, Black, Non-Hispanic, and Asian, Non-Hispanic residents during 2002-2018.
* In 2018, relative to the rate among White, Non-Hispanic residents, the age-adjusted rate of asthma-related ED visits among 4.5 times higher among Black, Non-Hispanic residents and 4.8 times higher among Hispanics.

**Figure 4. Age-Adjusted Rates of Asthma-Related Emergency Department (ED) Visits by Race, Massachusetts Residents, 2002-2018**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Race/Ethnicity** | **Black, Non-Hispanic** | | | | | **Hispanic** | | | |
| **Year** | **No.** | **Crude Rate1** | **Age-Adjusted Rate1,2** | | **95% CI3** | **No.** | **Crude Rate1** | **Age-Adjusted Rate1,2** | **95% CI3** |
| 2002 | 6,163 | 164.3 | 154.9 | | 151.0 - 158.8 | 6,864 | 147.3 | 144.2 | 140.3 - 148.1 |
| 2003 | 6,700 | 176.1 | 165.8 | | 161.8 - 169.8 | 7,404 | 154.0 | 150.8 | 146.9 - 154.6 |
| 2004 | 6,050 | 157.4 | 149.5 | | 145.7 - 153.3 | 6,427 | 130.2 | 126.2 | 122.7 - 129.6 |
| 2005 | 6,045 | 155.5 | 146.9 | | 143.2 - 150.7 | 6,656 | 131.5 | 125.1 | 121.8 - 128.4 |
| 2006 | 6,030 | 150.9 | 142.3 | | 138.7 - 145.9 | 5,491 | 107.5 | 103.4 | 100.5 - 106.4 |
| 2007 | 6,019 | 150.0 | 143.2 | | 139.6 - 146.9 | 6,737 | 127.6 | 120.5 | 117.4 - 123.6 |
| 2008 | 6,459 | 159.6 | 151.6 | | 147.9 - 155.4 | 8,196 | 147.2 | 137.8 | 134.6 - 141.0 |
| 2009 | 5,918 | 141.6 | 135.2 | | 131.7 - 138.7 | 8,151 | 139.8 | 132.2 | 129.2 - 135.3 |
| 2010 | 5,681 | 136.8 | 132.8 | | 129.3 - 136.3 | 7,668 | 122.2 | 115.5 | 112.8 - 118.3 |
| 2011 | 5,977 | 132.5 | 128.2 | | 125.0 - 131.5 | 8,162 | 125.4 | 119.5 | 116.7 - 122.2 |
| 2012 | 6,082 | 146.5 | 142.4 | | 138.8 - 146.0 | 8,215 | 130.9 | 126.3 | 123.6 - 129.0 |
| 2013 | 5,974 | 143.9 | 140.3 | | 136.8 - 143.9 | 7,811 | 124.4 | 120.5 | 117.9 - 123.2 |
| 2014 | 6,034 | 145.3 | 140.8 | | 137.2 - 144.4 | 8,503 | 135.5 | 132.6 | 129.8 - 135.4 |
| 2015 | 6,234 | 150.1 | 144.8 | | 141.2 - 148.4 | 8,923 | 142.2 | 140.1 | 137.1 - 142.9 |
| 2016 | 6,008 | 144.7 | 139.5 | | 136.0 - 143.0 | 8,743 | 139.3 | 137.4 | 134.5 - 140.3 |
| 2017 | 5,755 | 138.6 | 134.2 | | 130.7 - 137.6 | 8,505 | 135.5 | 135.0 | 132.1 - 137.9 |
| 2018 | 5,692 | 137.0 | 132.8 | | 129.3 - 136.2 | 8,875 | 141.4 | 142.4 | 139.4 - 145.3 |
|  | **Slope5** |  | **95% CI3** | | |  | **Slope5** |  | **95% CI3** |
| **Trend Analysis4** | -1.77 |  | -1.88 - -0.67 | | | **Trend Analysis4** | -1.10 |  | -2.90 - 0.70 |
|  |  | **P-Value6** | | |  |  |  | **P-Value6** |  |  |
|  |  | 0.01 | | |  |  |  | 0.25 |  |
| **Race/Ethnicity** | **White, Non-Hispanic** | | | | | **Asian/Pacific Islander, Non-Hispanic** | | | |  | |  |  |  | 0.1610 |
| **Year** | **No.** | **Crude Rate1** | **Age-Adjusted Rate1,2** | | **95% CI3** | **No.** | **Crude Rate1** | **Age-Adjusted Rate1,2** | **95% CI3** |
| 2002 | 23,061 | 43.6 | 45.7 | | 45.1 - 46.3 | 398 | 14.0 | 13.8 | 12.4 - 15.3 |
| 2003 | 23,938 | 45.4 | 47.9 | | 47.3 - 48.5 | 476 | 16.2 | 16.1 | 14.6 - 17.6 |
| 2004 | 20,971 | 40.0 | 42.3 | | 41.7 - 42.8 | 424 | 14.0 | 14.3 | 12.9 - 15.8 |
| 2005 | 21,456 | 41.1 | 43.4 | | 42.9 - 44.0 | 426 | 13.7 | 14.1 | 12.7 - 15.5 |
| 2006 | 20,118 | 38.8 | 41.3 | | 40.7 - 41.9 | 436 | 13.5 | 13.9 | 12.5 - 15.3 |
| 2007 | 19,751 | 38.1 | 40.8 | | 40.2 - 41.4 | 513 | 15.8 | 16.1 | 14.6 - 17.5 |
| 2008 | 20,892 | 40.3 | 43.4 | | 42.8 - 44.0 | 619 | 18.7 | 19.0 | 17.5 - 20.6 |
| 2009 | 20,128 | 38.5 | 41.9 | | 41.3 - 42.5 | 581 | 16.8 | 16.7 | 15.3 - 18.1 |
| 2010 | 18,052 | 35.2 | 38.6 | | 38.0 - 39.1 | 518 | 14.4 | 14.8 | 13.5 - 16.1 |
| 2011 | 18,516 | 36.4 | 40.0 | | 39.5 - 40.6 | 562 | 14.7 | 15.0 | 13.7 - 16.2 |
| 2012 | 19,360 | 37.7 | 40.8 | | 40.2 - 41.3 | 572 | 15.5 | 15.9 | 14.6 - 17.2 |
| 2013 | 17,631 | 34.3 | 37.2 | | 36.6 - 37.7 | 635 | 17.1 | 17.8 | 16.4 - 19.2 |
| 2014 | 17,471 | 34.0 | 37.0 | | 36.4 - 37.5 | 623 | 16.8 | 17.5 | 16.2 - 18.9 |
| 2015 | 17,300 | 33.7 | 36.2 | | 35.7 - 36.8 | 687 | 18.5 | 19.2 | 17.8 - 20.7 |
| 2016 | 15,479 | 30.1 | 33.0 | | 32.5 -33.5 | 617 | 16.6 | 17.5 | 16.1 - 18.9 |
| 2017 | 14,493 | 28.2 | 30.6 | | 30.1 - 31.1 | 616 | 16.6 | 17.3 | 15.9 - 18.6 |
| 2018 | 13,942 | 27.2 | 29.5 | | 29.0 - 30.0 | 646 | 17.4 | 18.4 | 17.0 - 19.8 |
|  | **Slope5** |  | **95% CI3** | | |  | **Slope5** |  | **95% CI3** |
| **Trend Analysis4** | -0.70 |  | -0.94 - -0.46 | | | **Trend Analysis4** | 0.23 |  | 0.03 - 0.43 |
|  |  | **P-Value6** | |  | |  |  | **P-Value6** |  |
|  |  | <0.01 | |  | |  |  | 0.05 |  |

1. Rate of asthma-related emergency department visits per 10,000 residents.

2. Age-adjusted to US 2010 population.

3. 95% Confidence Interval.

4. Trend analysis was performed using 2002-2014 data only due to ICD-9-CM diagnosis code having been changed to ICD-10-CM diagnosis code in October 2015 and after.

5. Slope (slope of the best line of fit calculated using JoinPoint Software) = the average age-adjusted rate increase or decrease per year (e.g. a slope of 1.0 indicates that the age-adjusted rate increased on average one per 10,000 residents per year).

6. P-value < 0.05 is considered statistically significant because it means that there is at most a 5% chance of observing a trend, given that, in reality, rates are stable.

Data Source: CY2002-2018 Massachusetts Emergency Department Discharge Database, Massachusetts Center for Health Information and Analysis.

***By Age***

From 2016 through 2018, among Massachusetts children, the age-specific rates of asthma-related ED visits were consistently highest among those ages 0 - 4 years old and decreased with increasing age group. Among adults, the rates were highest among young adults ages 25 - 29. The rates declined with each older adult age group and the lowest rates were among those ages 65 and over. Within each age group except those aged 0-9 years, the rates remained stable from 2016 through 2018 (Figure 5).

**Figure 5. Age-Specific Rates of Emergency Department (ED) Visits Due to Asthma, Massachusetts Residents, 2016-2018**

Data Source: CY2016-2018 Massachusetts Emergency Department Discharge Database, Massachusetts Center for Health Information and Analysis.

***By Gender***

From 2002 through 2018, the age-adjusted rate of asthma-related ED visits remained stable among both males and females (Figure 6). During the same time period, the age-adjusted rate was consistently higher among females than males. The rate among females significantly decreased from 2002 to 2014.

**Figure 6. Age-Adjusted Rates of Asthma-Related Emergency Department (ED) Visits by Sex, Massachusetts Residents, 2002-2018**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **Male** | | | | | **Female** | | | | |
| **Year** | | **No.** | **Crude Rate1** | **Age-Adjusted Rate1,2** | | **95% CI3** | **No.** | **Crude Rate1** | **Age-Adjusted Rate1,2** | | **95% CI3** |
| 2002 | | 16,985 | 54.7 | 54.9 | | 54.1 - 55.7 | 21,027 | 63.3 | 65.0 | | 64.1 - 65.8 |
| 2003 | | 18,219 | 58.5 | 59.1 | | 58.2 - 60.0 | 21,933 | 65.9 | 68.1 | | 67.2 - 69.0 |
| 2004 | | 15,942 | 51.1 | 51.9 | | 51.1 - 52.7 | 19,393 | 58.4 | 60.3 | | 59.5 - 61.2 |
| 2005 | | 16,180 | 51.8 | 52.7 | | 51.9 - 53.5 | 19,921 | 60.1 | 62.1 | | 61.3 - 63.0 |
| 2006 | | 16,941 | 54.3 | 55.9 | | 55.0 - 56.7 | 20,078 | 60.5 | 62.9 | | 62.0 - 63.8 |
| 2007 | | 16,290 | 52.1 | 54.1 | | 53.3 - 54.9 | 19,069 | 57.4 | 59.9 | | 59.0 - 60.7 |
| 2008 | | 17,458 | 55.4 | 57.6 | | 56.7 - 58.4 | 20,415 | 61.0 | 64.0 | | 63.1 - 64.9 |
| 2009 | | 16,650 | 52.0 | 54.3 | | 53.4 - 55.1 | 19,810 | 58.5 | 61.4 | | 60.5 - 62.3 |
| 2010 | | 15,147 | 47.8 | 50.5 | | 49.7 - 51.4 | 18,298 | 54.1 | 57.3 | | 56.5 - 58.2 |
| 2011 | | 15,824 | 49.6 | 50.5 | | 52.0 - 53.6 | 19,015 | 56.0 | 57.3 | | 58.3 - 60.0 |
| 2012 | | 16,630 | 52,5 | 55.0 | | 54.2 - 55.9 | 19,173 | 56,7 | 59.5 | | 58.6 - 60.3 |
| 2013 | | 15,908 | 50.2 | 52.7 | | 51.9 - 53.5 | 17,923 | 53,0 | 55.5 | | 54.7 - 56.3 |
| 2014 | | 16,148 | 51.0 | 53.6 | | 52.7 - 54.4 | 18,444 | 54,6 | 57.2 | | 56.3 - 58.0 |
| 2015 | | 16,461 | 52.0 | 54.4 | | 53.5 - 55.2 | 18,576 | 54.9 | 57.2 | | 56.4 - 58.0 |
| 2016 | | 15,491 | 48.9 | 51. 5 | | 50.6 - 52.3 | 17,342 | 51.2 | 53.9 | | 53.1 - 54.7 |
| 2017 | | 14,706 | 46.4 | 48.7 | | 47.9 - 49.5 | 16,601 | 49.1 | 51.5 | | 50.7 - 52.3 |
| 2018 | | 14,286 | 45.1 | 47.3 | | 46.5 - 48.0 | 16,494 | 48.8 | 51.0 | | 50.2 - 51.8 |
| **Trend Analysis4** | **Slope5** | | | | **95% CI3** | | **Slope5** | | | **95% CI3** | |
| -0.004 | | | | -0.01 - 0.002 | | -0.72 | | | -1.08 - -0.36 | |
| **P-Value6** | | | | | | **P-Value6** | | | | |
| 0.25 | | | | | | <0.01 | | | | |

1. Rate of asthma-related emergency department visits per 10,000 residents.

2. Age-adjusted to US 2010 population.

3. 95% Confidence Interval.

4. Trend analysis was performed using 2002-2014 data only due to ICD-9-CM diagnosis code having been changed to ICD-10-CM diagnosis code in October 2015 and after.

5. Slope (slope of the best line of fit calculated using JoinPoint Software) = the average age-adjusted rate increase or decrease per year (e.g. a slope of 1.0 indicates that the age-adjusted rate increased on average one per 10,000 residents per year).

6. P-value < 0.05 is considered statistically significant because it means that there is at most a 5% chance of observing a trend, given that, in reality, rates are stable.

Data Source: CY2002-2018 Massachusetts Emergency Department Discharge Database,

Massachusetts Center for Health Information and Analysis.

***By Age and Gender***

* In 2018, Massachusetts females had a higher rate of asthma-related ED visits than males (51.0 vs. 47.3 visits per 10,000, respectively).
* The age-specific rates of asthma-related ED visits varied by sex, with the largest discrepancy in the 0-4 year age group. In this group, as well as the 5-9 and 10-14 year age groups, the rates were higher among males than females (Figure 7).
* Starting in the 15-19 year age group and continuing through adulthood, rates of ED visits were consistently higher among females than males.

**Figure 7. Age-Sex-Specific Rates of Asthma-Related Emergency Department (ED) Visits, Massachusetts Residents, 2018**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Male** | | | **Female** | | |
| **Age Group** | **No.** | **Age-Specific Rate1** | **95% CI2** | **No.** | **Age-Specific Rate1** | **95% CI2** |
| 00 - 04 | 2,411 | 128.5 | 123.4 - 133.7 | 1,372 | 76.5 | 72.4 - 80.5 |
| 05 - 09 | 1,963 | 99.9 | 95.5 - 104.3 | 1,236 | 65.4 | 61.7 - 69.0 |
| 10 - 14 | 1,078 | 52.0 | 48.9 - 55.15 | 832 | 42.0 | 39.1 - 44.8 |
| 15 - 19 | 809 | 34.4 | 32.1 - 36.8 | 1,030 | 45.2 | 42.4 - 48.0 |
| 20 - 24 | 1,096 | 46.4 | 43.7 - 49.1 | 1,526 | 63.7 | 60.5 - 66.9 |
| 25 - 29 | 1,410 | 64.6 | 61.2 - 68.0 | 1,654 | 74.1 | 70.5 - 77.7 |
| 30 - 34 | 986 | 49.7 | 46.6 - 52.8 | 1,346 | 65.6 | 62.1 - 69.1 |
| 35 - 39 | 953 | 46.8 | 43.8 - 49.7 | 1,235 | 57.6 | 54.4 - 60.8 |
| 40 - 44 | 690 | 30.2 | 27.9 - 32.4 | 1,156 | 48.1 | 45.3 - 50.9 |
| 45 - 49 | 734 | 29.1 | 27.0 - 31.2 | 1,187 | 45.1 | 42.5 - 47.6 |
| 50 - 54 | 717 | 29.7 | 27.5 - 31.8 | 1,121 | 43.9 | 41.3 - 46.5 |
| 55 - 59 | 544 | 26.1 | 23.9 - 28.3 | 902 | 40.2 | 37.6 - 42.9 |
| 60 - 64 | 344 | 19.5 | 17.5 - 21.6 | 676 | 34.8 | 32.2 - 37.4 |
| 65+ | 551 | 14.6 | 13.4 - 15.9 | 1,221 | 23.2 | 21.9 - 24.5 |
| All Ages | 14,286 | 47.3 | 46.8 - 48.0 | 16,494 | 51.0 | 50.2 - 51.8 |

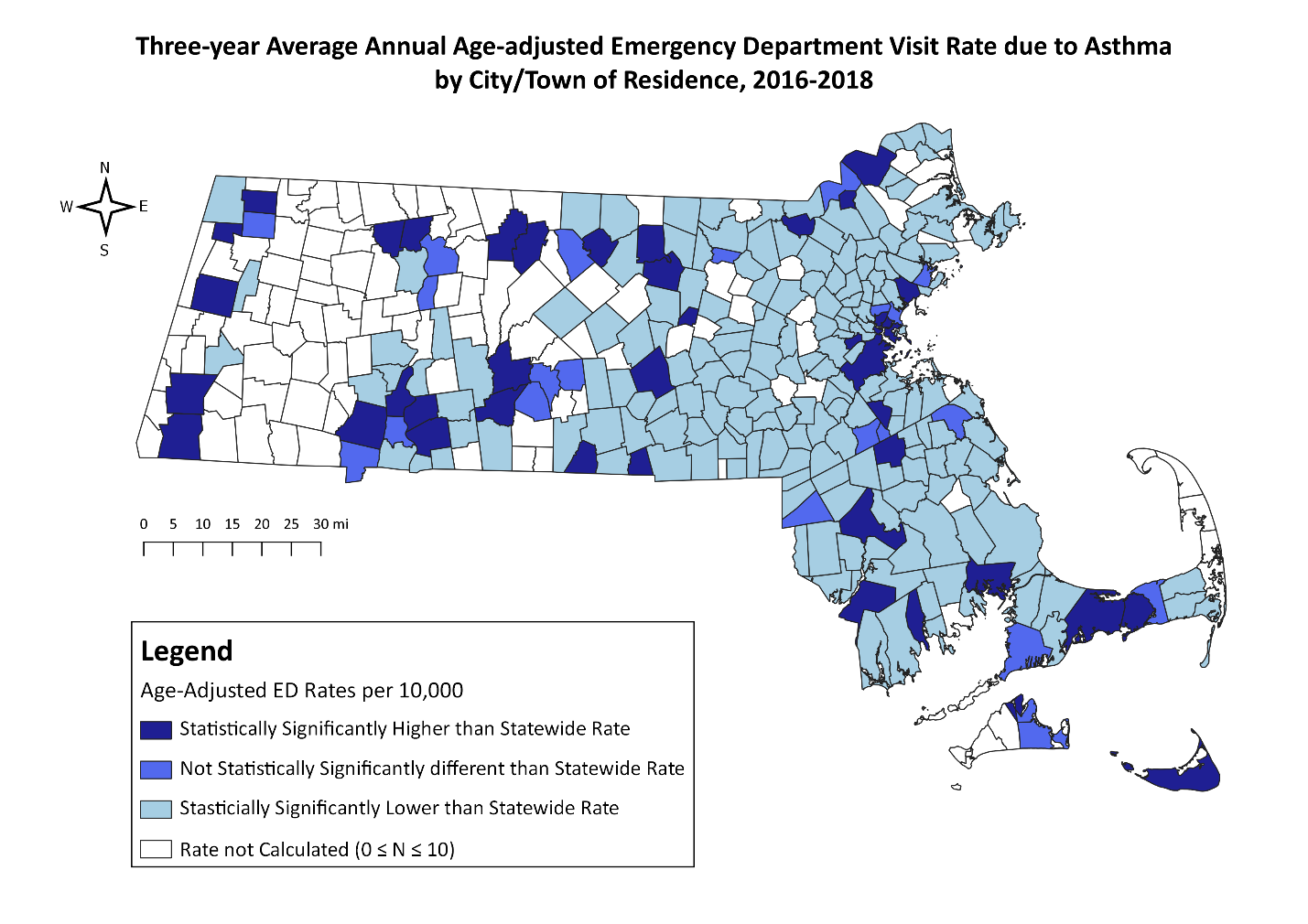
1. Rate of asthma-related emergency department visits per 10,000 residents

2. 95% Confidence Interval.

Data Source: CY2018 Massachusetts Emergency Department Discharge Database, Massachusetts Center for Health Information and Analysis.

***By Geography***

**Map 1. Three-Year Average Annual Age-Adjusted Rate of Emergency Department (ED) Visits Due to Asthma by City/Town of Residence, Massachusetts, 2016-2018**



Statewide age-adjusted rate of ED visits:

50.9 ED visits per 10,000 Massachusetts Residents

Data Source: CY2016-2018 Massachusetts Emergency Department Discharge Database, Massachusetts Center for Health Information and Analysis.

* Data were not available for 110 Massachusetts cities/towns (white in Map 1).
* The three-year average annual age-adjusted rates of asthma-related ED visits were not evenly distributed across the state among the 241 cities/towns for which data was available.
* The overall Massachusetts average annual age-adjusted rate was 50.9 ED visits per 10,000 residents.

**Table 1. Top 10 Cities/Towns with the Highest Three-Year Average Annual Age-Adjusted Rate of Emergency Department (ED) Visits Due to Asthma in Massachusetts, 2016-2018**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Town** | **2016-2018 Total Cases** | **Average Annual**  **Age Adjusted Rate Per 10,000** | **95% CI1** | |
| Holyoke | 2,330 | 198.09 | 190.05 | 206.14 |
| Springfield | 7,241 | 159.50 | 155.82 | 163.17 |
| Fall River | 3,148 | 123.16 | 118.86 | 127.46 |
| Lawrence | 2,784 | 118.00 | 113.62 | 122.39 |
| Brockton | 2,786 | 99.11 | 95.43 | 102.79 |
| Southbridge | 457 | 95.64 | 86.87 | 104.41 |
| Chicopee | 1,434 | 94.93 | 90.01 | 99.84 |
| New Bedford | 2,574 | 93.53 | 89.92 | 97.14 |
| Everett | 1,015 | 82.85 | 77.75 | 87.95 |
| Boston | 13,479 | 81.02 | 79.65 | 82.39 |

1.95% Confidence Interval.

Data Source: CY2016-2018 Massachusetts Emergency Department Discharge Database, Massachusetts Center for Health Information and Analysis.

**Summary of Hospital Setting**

Disparities in the burden of asthma among Massachusetts residents who had an asthma-related ED visit:

***By Race:***

* Black, Non-Hispanic and Hispanic residents accounted for a disproportionate share of the asthma-related ED visits in Massachusetts (Figure 8).
* In 2018, as a group that comprised only 11.6% of Massachusetts population, Hispanic residents accounted for 28.8% of asthma-related ED visits.
* Black, Non-Hispanic residents comprised 6.8% of the Massachusetts population, but accounted for 18.5% of asthma-related ED visits.

**Figure 8. Percent Distribution of Emergency Department (ED) Visits, Due to Asthma, by Race/Ethnicity, Massachusetts Residents, 2018**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **ED Visits** | | **2014-2018 Population** | |
| **Race/ Ethnicity** | **No.** | **%** | **No.** | **%** |
| White, Non-Hispanic | 13,942 | 45.3% | 4,930,412 | 72.2% |
| Black, Non-Hispanic | 5,692 | 18.5% | 463,796 | 6.8% |
| Hispanic | 8,875 | 28.8% | 789,127 | 11.6% |
| Asian/Pacific Island | 646 | 2.1% | 442,034 | 6.5% |
| **Total** | **30,780** |  | **6,830,193** |  |

Note: The numbers may not add up to the total since race/ethnicity was missing for some visits.

Data Source: CY2018 Massachusetts Hospitalization Discharge Database, Massachusetts Center for Health Information and Analysis (CHIA); 2014-2018 Population data: <https://datacommon.mapc.org/browser/datasets/6>.

***By Age:***

* In 2018, 58.3% of asthma-related ED visits in Massachusetts occurred among those less than 35 years of age (29.4% for ages 17 years and younger and 28.9% for ages 18-34 years) (Figure 9).

**Figure 9. Percent Distribution of Emergency Department (ED) Visits Due to Asthma, by Age, Massachusetts Residents, 2018**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **ED Visits** | | **2014 - 2018 Population** | |
| **Age Group** | **No.** | **%** | **No.** | **%** |
| 0-4 | 2,958 | 9.6% | 362,681 | 5.3% |
| 5-17 | 6,082 | 19.8% | 1,017,216 | 14.9% |
| 18-34 | 8,884 | 28.9% | 1,665,134 | 24.3% |
| 35-64 | 10,259 | 33.3% | 2,706,929 | 39.6% |
| 65+ | 1,723 | 5.6% | 1,078,224 | 15.8% |
| **Total** | **30,780** |  | **6,830,193** |  |

Note: The numbers may not add up to the total since age was missing for some visits.

Data Source: CY2018 Massachusetts Hospitalization Discharge Database, Massachusetts Center for Health Information and Analysis; 2014-2018 Population data: <https://datacommon.mapc.org/browser/datasets/363>.

***By Sex:***

* Females, a group that comprises 51.5% of the Massachusetts population, accounted for a disproportionate share of the asthma-related ED visits in Massachusetts reported in 2018 – 53.6% of ED visits (Figure 10).

**Figure 10. Percent Distribution of Emergency Department (ED) Visits Due to Asthma, Massachusetts Residents by Sex, 2018**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **ED Visits** | | **2014 - 2018 Population** | |
| **Sex** | **No.** | **%** | **No.** | **%** |
| Males | 14,286 | 46.4% | 3,313,979 | 48.5% |
| Female | 16,494 | 53.6% | 3,516,214 | 51.5% |
| **Total** | **30,780** |  | **6,830,193** |  |

Data Source: CY2018 Massachusetts Hospitalization Discharge Database, Massachusetts Center for Health Information and Analysis; 2014-2018 Population data: <https://datacommon.mapc.org/browser/datasets/363>.

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