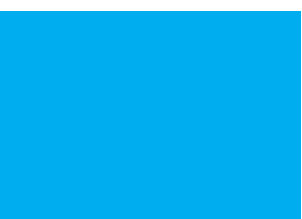


Asthma Among Older Adults in Massachusetts

RELEASED MAY 2011



Acknowledgements

This report was prepared by Kathleen Fitzsimmons, with assistance from Carrie Huisingh and Jean Zotter. Special thanks to Letitia Davis, Maria McKenna, Kathleen Grattan, Vivian Pun, James West, Jamie Wilkins, Jewel Mullen, Cheryl Bartlett, Elise Pechter, Joshua Nyambose, Elaine Rosenberg, members of the MDPH Internal Asthma Working Group, David Callahan, Kathie Sunnarborg and Sheila Erimez. We would also like to acknowledge the West Virginia Department of Health and Human Resources Asthma Education and Prevention Program for its work and statistical brief on this issue.

This work was supported by the Centers for Disease Control and Prevention Cooperative Agreement #5U59EH000502-02. Contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC.

Asthma Among Older Adults in Massachusetts

RELEASED MAY 2011



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Data Highlights

- **In 2009, an estimated 70,000 (8.4%) adults aged 65 and older (i.e. older adults) in Massachusetts had asthma.**
 - Current asthma prevalence was significantly higher among those aged 65-79 (9.5%) vs. 80+ (6.5%); women (10.2%) vs. men (6.4%); and Hispanics (12.6%) vs. White, Non-Hispanics (8.4%).
 - Current asthma prevalence among older adults significantly increased by an average of 4.1% per year from 2000 through 2009.
- **Of adults aged 65 and older with asthma in Massachusetts, only 1 in 5 had well-controlled asthma, and only 1 in 4 reported that they had ever been given an asthma action plan by a healthcare provider.**
- **There was an average of 9,475 asthma hospitalizations in Massachusetts each year from 2006 through 2008. Nearly a quarter (23.2%) of these were among residents aged 65 and older.**
 - The rate of asthma hospitalization among older adults increased 56% from 2000 through 2008, reaching 27.6 hospitalizations per 10,000 residents in 2008.
 - Among older adults, in 2008, the rate of asthma hospitalization for females was 1.5 times the rate for males. Rates for both Hispanics and Black, non-Hispanics were about 3.0 times higher than the rate for Whites.
- **Over half (53.2%) of the 615 deaths due to asthma in Massachusetts from 2000 through 2007 were among adults aged 65 and older.**
 - Although the asthma mortality rate among older adults has been declining, it has been consistently higher than the rate among younger Massachusetts residents.

Introduction



Asthma affects people of all ages and is a significant public health problem in the United States and Massachusetts. Asthma is a chronic inflammatory disease of the airways characterized by episodic wheezing, breathlessness, chest tightness, and coughing.¹ In 2008, an estimated 16.4 million adults (7.3%) and 7.0 million children (9.4%) in the US had asthma.^{2,3} Of adults with asthma, 15.9% were aged 65 and older (i.e. older adults). National data also show that this age group has consistently had the second highest rate of asthma hospitalization and the highest number and rate of deaths due to asthma.⁴

The diagnosis and management of asthma in older adults may pose unique challenges, even though the currently recommended guidelines are applicable to asthma patients of all ages.⁵ Studies have shown that asthma in older adults is under diagnosed and under treated.⁶ Experts also agree that there are considerable knowledge gaps around many facets of asthma in the elderly, including the epidemiology of the disease and the effectiveness of interventions in this population.^{5,6}

The need for public health action to address asthma among older adults in Massachusetts is evident. Approximately 17% of the 5.1 million adult residents of the Commonwealth are aged 65 and older, and this population is projected to grow in the coming years. Recent surveillance findings from the Asthma Prevention and Control Program in the Massachusetts Department of Public Health revealed that, consistent with national findings, older adults had the second highest asthma hospitalization rate and the highest asthma mortality rate of any age group in the Commonwealth.⁷ Based on these findings, the *Strategic Plan for Asthma in Massachusetts, 2010-2014* identified older adults as a priority population for interventions.⁸ The purpose of this bulletin is to provide an epidemiologic overview of asthma among adults aged 65 and older in Massachusetts. We address a gap in information on asthma in this population in order to inform a task force of experts charged with developing recommendations for targeted asthma interventions for this group. While data on asthma among Massachusetts residents younger than 65 are included for reference throughout this bulletin, details on the burden of asthma in these younger age groups have been described elsewhere.⁷

Massachusetts estimates in this bulletin are based on data from the Behavioral Risk Factor Surveillance System, the Adult Asthma Call-

The purpose of this bulletin is to provide an epidemiologic overview of asthma among adults aged 65 and older in Massachusetts. We address a gap in information on asthma in this population in order to inform a task force of experts charged with developing recommendations for targeted asthma interventions for this group.

back Survey, the Massachusetts Inpatient Hospital Discharge Database, and Massachusetts Registry of Vital Records and Statistics Data. Findings are compared to national estimates where possible. More information on data sources is included at the end of this report.

Asthma Prevalence



Both nationally and in Massachusetts, the prevalence of asthma in older adults is high. In 2009, 10.7% of US and 12.1% of Massachusetts adults aged 65 and older reported ever having been diagnosed with asthma; 7.5% and 8.4%, still had asthma, respectively. That means that an estimated 3 million US and 70,000 Massachusetts older adults had asthma in 2009.

Not only is asthma prevalence among older adults high, but it is also significantly increasing nationwide and in the Commonwealth (Table 1). In Massachusetts, from 2000 through 2009, current asthma prevalence increased by an average of 4.1% per year, and lifetime asthma prevalence increased by an average of 4.6% annually. Likewise, in the US as a whole, the average annual percent increases of current and lifetime asthma prevalence were 1.8% and 2.3%, respectively.

Table 1. Prevalence of Current and Lifetime Asthma in Adults Aged 65 and Older, Massachusetts and United States, 2000-2009

	Current Asthma				Lifetime Asthma			
	MA		US		MA		US	
Year	% ^a	95% CI ^b	% ^a	95% CI ^b	% ^a	95% CI ^b	% ^a	95% CI ^b
2000	5.9	4.5 - 7.3	6.6	6.1 - 7.0	7.6	6.0 - 9.2	8.7	8.2 - 9.2
2001	6.8	5.3 - 8.3	6.5	6.1 - 6.9	9.6	7.8 - 11.4	9.3	8.8 - 9.8
2002	6.0	4.5 - 7.5	7.2	6.7 - 7.6	8.1	6.4 - 9.8	10.1	9.5 - 10.6
2003	7.7	6.0 - 9.4	7.2	6.8 - 7.5	10.7	8.5 - 12.8	10.0	9.5 - 10.5
2004	8.5	6.8 - 10.3	7.4	7.1 - 7.8	12.6	10.6 - 14.7	11.0	10.5 - 11.5
2005	7.6	6.1 - 9.2	7.3	7.0 - 7.6	10.7	8.9 - 12.5	10.5	10.1 - 10.9
2006	7.4	6.2 - 8.6	7.6	7.3 - 8.0	10.0	8.6 - 11.4	10.9	10.5 - 11.3
2007	8.5	7.6 - 9.5	7.5	7.2 - 7.8	12.0	10.9 - 13.1	10.8	10.5 - 11.2
2008	8.9	7.9 - 10.0	8.0	7.7 - 8.3	12.0	10.8 - 13.2	11.3	11.0 - 11.6
2009	8.4	7.3 - 9.6	7.5	7.3 - 7.7	12.1	10.7 - 13.4	10.7	10.4 - 11.0

a Percents are weighted to population characteristics.

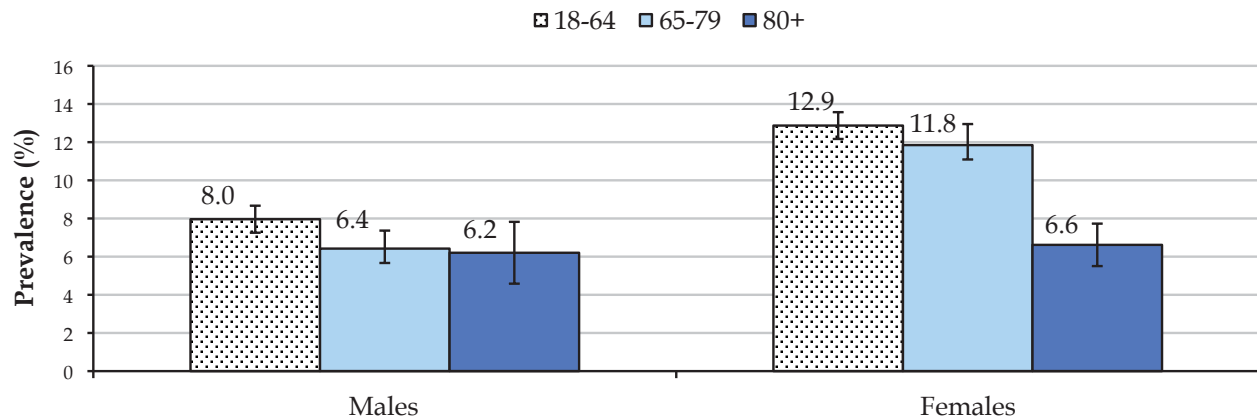
b 95% Confidence Interval.

Data Sources: MA: 2000-2009 Massachusetts Behavioral Risk Factor Surveillance System; US: 2000-2009 United States Behavioral Risk Factor Surveillance System.

Prevalence of current asthma decreases with age among Massachusetts adults. Overall, during the period 2007 through 2009, Massachusetts

adults aged 65 and older had a significantly lower prevalence of current asthma compared to those aged 18-64 (8.6% vs. 10.5%). Among older adults prevalence differed by age and sex (Figure 1). Females aged 65-79 had a significantly higher prevalence of current asthma (11.8%) than any other group of older adults.

Figure 1. Prevalence of Current Asthma by Sex and Age, Massachusetts, 2007-2009



Note: Error bars are 95% Confidence Intervals. Percents weighted to population characteristics.
Data Source: 2007-2009 Massachusetts Behavioral Risk Factor Surveillance System.

Among Massachusetts adults aged 65 and older, prevalence of current asthma was significantly higher among:*

- Those aged 65-79 compared to those aged 80 and older (9.5% vs. 6.5%).
- Females compared to males (10.2% vs. 6.4%).
- Hispanics compared to White, Non-Hispanics (12.6% vs. 8.4%); the prevalence among Black, Non-Hispanics (9.1%) did not differ significantly from that of either group.
- Those with less than a high school degree compared to those with four or more years of college (11.4% vs. 6.9%).
- Those who reported household incomes of less than \$25,000 compared to those with household incomes of \$75,000 or greater (10.4% vs. 7.4%).
- Those with a disability compared to those without (14.1% vs. 6.5%).
- Those who were overweight or obese, compared to those who were not (10.0% vs. 6.2% and 13.5% vs. 7.2%, respectively).

*Note: Data not graphed. Data Source: 2007-2009 Massachusetts Behavioral Risk Factor Surveillance System.

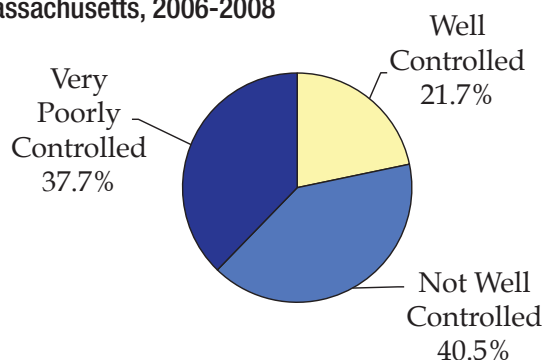
Characteristics of Older Adults with Asthma



In most cases of asthma, the cause of the disease is unknown. While the causes of asthma may not be known and no cure exists, asthma can be controlled. Expert guidelines describe asthma control as having minimal symptoms and functional impairment.¹ According to recent survey findings, only 21.7% of Massachusetts older adults with asthma have good control of their disease (Figure 2).

According to recent survey findings, only 21.7% of Massachusetts older adults with asthma have good control of their disease.

Figure 2. Level of Asthma Control among Adults Aged 65 and Older with Current Asthma, Massachusetts, 2006-2008



Note: Percents are weighted to population characteristics. The algorithm used to classify asthma control was derived from criteria set forth by the EPR-3 Report¹ and involves responses to survey questions including: daytime symptoms, nighttime awakenings, use of an inhaled short-acting beta agonist, and interference with normal activities. For more information, refer to the *Burden of Asthma in Massachusetts* report.⁷

Data Source: 2006-2008 BRFSS Adult Asthma Call-Back Survey.

Among Massachusetts adults aged 65 and older with current asthma:*

- 82.6% were first diagnosed as adults (mean age of diagnosis = 44.8 years).
- 58.4 % reported having symptoms of asthma in the past month.
- 63.1% limited usual activities because of their asthma in the past year.
- 19.5% had sleep disrupted due to asthma symptoms in the past month.
- 75.9% reported taking rescue medications in the past 3 months.
- 25.3% reported an unscheduled office visit for asthma in the past year.
- 56.0% reported a chronic obstructive pulmonary disease (COPD) diagnosis.
- 29.9% reported a diagnosis of depression. While not necessarily caused by asthma, depression may contribute to disruption of usual activities.

*Note: Data not graphed. Data Source: 2006-2008 BRFSS Adult Asthma Call-Back Survey.

Exposures at home can affect people with asthma. For the most part, the same factors that exacerbate asthma in younger patients do so in older patients as well.⁵ In Massachusetts, 85.5% of adults aged 65 and older with asthma reported the presence of common triggers in their homes; most (96.5%) also reported the presence of at least one environmental modification that may reduce symptoms (Table 2).

Table 2. Environmental Triggers and Modifications in Homes of Adults Aged 65 and Older with Current Asthma, Massachusetts, 2006-2008

Environmental Trigger^a	%^b	95% CI^c
Carpets or rugs	66.0	56.2 - 75.8
Gas used for cooking, gas fireplace, or unvented gas stove	29.4	20.5 - 38.4
Pets in home or allowed in bedroom	38.7	28.2 - 49.3
Wood burning fireplace/stove	14.1	6.3 - 21.8
Environmental tobacco smoke among former/never smokers ^d	7.4	4.3 - 10.5
Environmental Modification		
Exhaust fan used in bathroom	65.3	55.3 - 75.2
Exhaust fan used in kitchen	63.3	52.9 - 73.7
Sheets washed in hot water	42.2	31.8 - 52.7
Mattress cover	33.2	22.6 - 43.8
Pillow cover	29.5	19.5 - 39.6
Dehumidifier used	43.3	32.4 - 54.2
Air cleaner/purifier used	30.3	20.2 - 40.4

a Estimates for presence of mold, mice, and cockroaches were unstable (relative standard error >30%) and are not presented.

b Percents are weighted to population characteristics.

c 95% Confidence Interval.

d Data Source: 2006-2008 Massachusetts BRFSS.

Data Source (unless otherwise noted): 2006-2008 BRFSS Adult Asthma Call-Back Survey.

Asthma Treatment Guidelines



Recent survey findings indicate that care for many older adults with asthma in Massachusetts fails to follow recommended treatment guidelines.^{a,b,c} Adoption by providers of the following NIH asthma guidelines for making appropriate clinical decisions about asthma care would standardize care and improve patient outcomes:^{1,5}

- **Persons with asthma should have 2 or more visits per year with a healthcare professional for routine asthma care.** In Massachusetts, 47.3% of older adults with asthma reported having the recommended number of routine checkups in the past year. Another 14.6% reported one visit, while 38.1% reported no routine visits for asthma in the past year.^a
- **Treatment should result in minimal to no emergency department visits for persons because of their asthma.** In Massachusetts, 17.5% of older adults with asthma reported one or more emergency department visits due to asthma in the past 12 months.^a
- **Older adults with asthma should receive an influenza vaccination annually by virtue of their age and asthma status.** In Massachusetts, 81.1% of older adults with asthma reported having an influenza vaccination in the past 12 months.^b
- **All adults aged 65 years and older should receive a pneumococcal vaccination per recommended schedule.** In Massachusetts, 84.1% of older adults with asthma reported ever having a pneumococcal vaccination.^b
- **Persons with asthma should have an Asthma Action Plan.** In Massachusetts, only 24.6% of older adults with asthma reported ever having been given an Asthma Action Plan by their healthcare provider.^a
- **Persons with asthma should receive instruction on how to recognize signs and symptoms of an attack.** In Massachusetts, 58.0% of older adults with asthma were taught how to recognize early signs and symptoms of an asthma attack. It is also essential that older adults with asthma understand how to deal with exacerbations of their asthma. In Massachusetts, 69.1% were taught by a health professional what to do in response to an asthma attack. The guidelines also suggest that the use of peak flow monitoring at home may be

Adoption by providers of the NIH asthma guidelines for making appropriate clinical decisions about asthma care would standardize care and improve patient outcomes.

a Data Source: 2006-2008 BRFSS Adult Asthma Call-Back Survey.

b Data Source: 2009 Massachusetts Behavioral Risk Factor Surveillance System.

c Data Source: 2006-2008 Massachusetts Behavioral Risk Factor Surveillance System.

important for some patients with asthma. In Massachusetts, 46.7% of older adults with asthma were taught how to use a peak flow meter to adjust daily medications.^a

■ **Persons with asthma should have a discussion with their healthcare provider about environmental exposures at their home and work.**

In Massachusetts, 33.7% of older adults with asthma were advised by a provider to change aspects of their home or work to improve their asthma. Thirty-one percent believed their asthma was caused or made worse by any job they'd had, but only 7.7% reported telling or being told by a healthcare provider that their asthma was related to exposures in workplace.^a

■ **Smoking or exposure to tobacco smoke should be avoided.**

In Massachusetts, 6.2% of older adults with asthma were characterized as current smokers.^b In addition, 7.4% of never or former smokers reported exposure to environmental tobacco smoke at home in the past week.^c

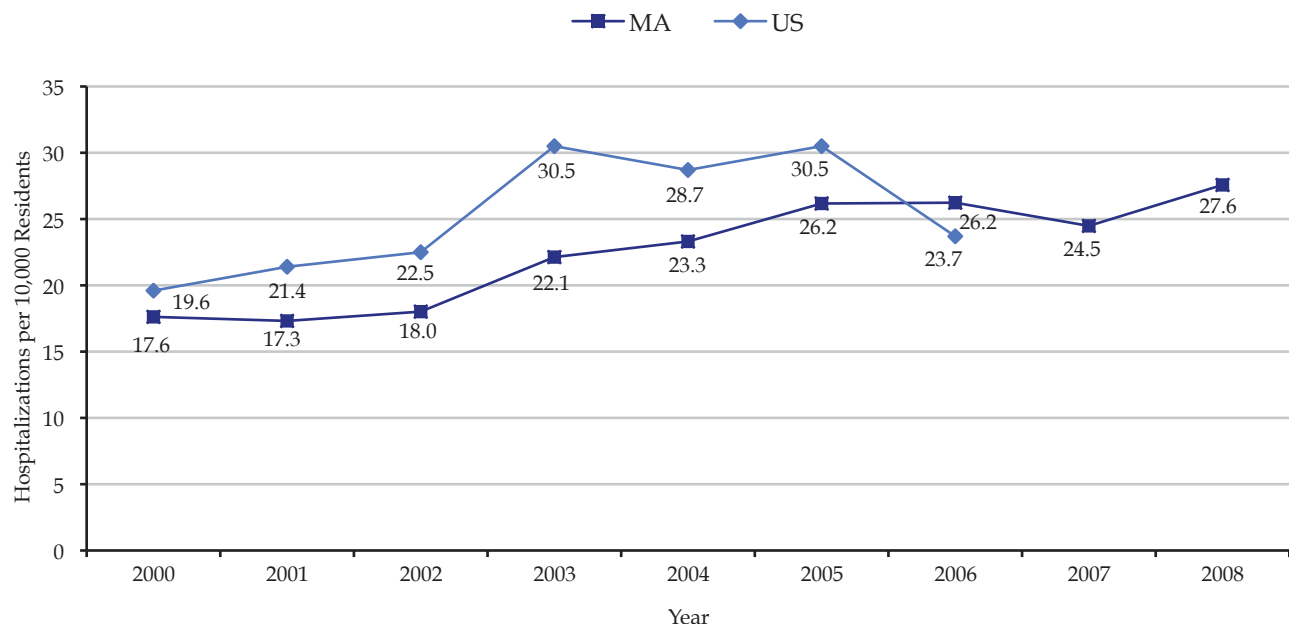
Asthma Hospitalizations



Poor asthma outcomes, such as hospitalizations, are considered largely preventable with access to high quality healthcare, appropriate asthma management, and adequate education about the disease. During 2006 through 2008, there were an average of 9,725 hospitalizations for asthma each year in Massachusetts; nearly a quarter (23.2%) were among residents aged 65 and older. Forty-four percent of asthma hospitalizations among older adults occurred during January through April, and the overall seasonal pattern was distinct from that observed among children (data not shown). Compared to adults aged 18-64, older adults had significantly longer average length of stay (4.6 vs. 3.5 days) and higher mean total charge (\$12,745 vs. \$10,368) per asthma hospitalization. Medicare was the expected payer for 90% of asthma hospitalizations among older adults.

Poor asthma outcomes, such as hospitalizations, are considered largely preventable with access to high quality healthcare, appropriate asthma management, and adequate education about the disease.

Figure 3. Rate of Hospitalization for Asthma Among Adults Aged 65 and Older, Massachusetts and United States, 2000-2008



Note: US estimates not yet available for 2007 or 2008.

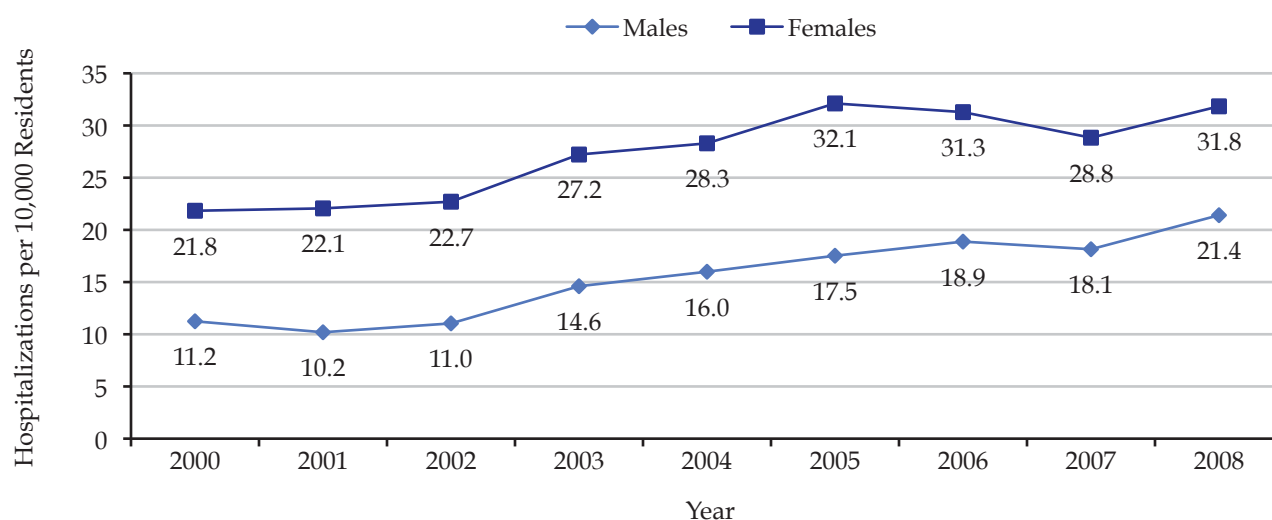
Data Source: MA: CY2000-2008 Massachusetts Inpatient Hospital Discharge Database. Accessed at MassCHIP v.3.00, r324, Massachusetts Department of Public Health; US: 2000-2006 National Hospital Discharge Survey.

The rate of asthma hospitalization among adults aged 65 and older in the Commonwealth is increasing. From 2000 through 2008, the rate

significantly increased by 6.2% per year. Overall, the rate rose 56% from 17.6 hospitalizations per 10,000 residents in 2000 to 27.6 per 10,000 in 2008 (Figure 3). In contrast, the rate of asthma hospitalization for younger adults aged 18-64 did not change significantly during this time period and averaged 10.7 per 10,000 each year. For all years 2000 through 2006, except 2003, rates of hospitalization for asthma among older adults in Massachusetts and the US did not differ significantly.

Disparities in asthma hospitalizations exist by gender and race/ethnicity. From 2000 through 2008, the asthma hospitalization rates for older adult males and females significantly increased (annual percentage increase =9.4% and 5.1%, respectively). For each year, the rate for females aged 65 and older was significantly higher than the rate for males (Figure 4). In 2008, the rate among females was 1.5 times the rate for males (31.8 vs. 21.4 per 10,000).

Figure 4. Rate of Hospitalization for Asthma Among Adults Aged 65 and Older by Sex, Massachusetts, 2000-2008



Data Source: CY2000-2008 Massachusetts Inpatient Hospital Discharge Database. Accessed at MassCHIP v.3.00 r324, Massachusetts Department of Public Health.

For each year 2000 through 2008, the rates for Hispanic and Black, non-Hispanic older adults were significantly higher than the rate for White, non-Hispanics. In 2008, the rates for Hispanics and Black, non-Hispanics were 3.3 and 2.8 times higher than the rate for Whites, respectively (data not shown). Among older adults, Hispanic females had a significantly higher average annual rate of hospitalization for asthma compared to any other sex - race/ethnicity group examined (Table 3).

Rates of asthma hospitalization among older adults vary throughout the state. From 2006 through 2008, older adults in the Community Health Network Areas (CHNAs) listed below had average annual rates of hospitalization for asthma significantly higher than the statewide rate of 26.1 hospitalizations per 10,000 residents (Figure 5).

Table 3. Number and Three-Year Average Annual Rate of Hospitalization for Asthma Among Adults Aged 65 and Older by Race/Hispanic Ethnicity and Sex, Massachusetts, 2006-2008

Race/Ethnicity	Total			Male			Female		
	# ^a	Rate ^b	95% CI	# ^a	Rate ^b	95% CI	# ^a	Rate ^b	95% CI
Hispanic	489	71.7	65.5 - 78.2	146	52.6	44.6 - 61.7	343	84.7	76.1 - 94.1
Black, Non-Hispanic	521	58.8	53.9 - 64.1	183	53.5	46.1 - 61.7	338	62.2	55.8 - 69.1
White Non-Hispanic	5,334	22.4	21.8 - 23.0	1,561	16.1	15.4 - 17.0	3,773	26.7	25.9 - 27.6
Total	6,764	26.0	25.4 - 26.6	2,057	19.4	18.6 - 20.3	4,707	30.5	29.7 - 31.4

a Total # of hospitalizations for asthma during the three-year time period (2006-2008).

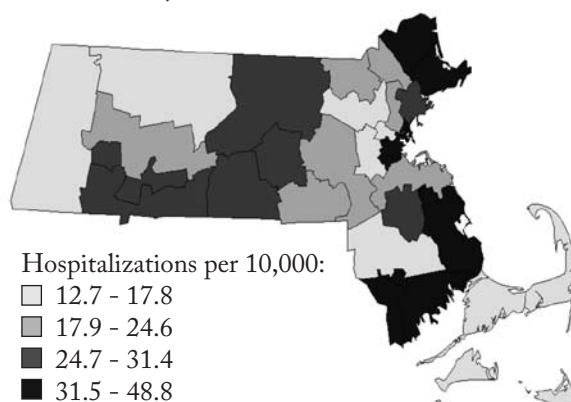
b Three-year average annual rate per 10,000 residents.

Note: There were 261 asthma hospitalizations among those classified as 'Other, Non-Hispanic' and 151 among those with 'Unknown' race/ethnicity.

Data Source: CY2006-2008 Massachusetts Inpatient Hospital Discharge Database.

Figure 5. Three-year Average Annual Rate of Hospitalization for Asthma Among Adults Aged 65 and Older by Community Health Network Area (CHNA) of Residence, Massachusetts, 2006-2008

Rates higher than state average of 26.1 hospitalizations per 10,000 (black on map):
 CHNA 26. Greater New Bedford (48.8)
 CHNA 25. Fall River (47.2)
 CHNA 23. South Shore /Plymouth (36.6)
 CHNA 19. Boston/Chelsea/Revere/Winthrop (36.0)
 CHNA 12. Greater Haverhill (35.5)
 CHNA 13. Beverly/Gloucester (32.8)
 CHNA 22. Greater Brockton (31.5)



Note: More information on Community Health Network Areas is available at www.mass.gov/dph/ohc.

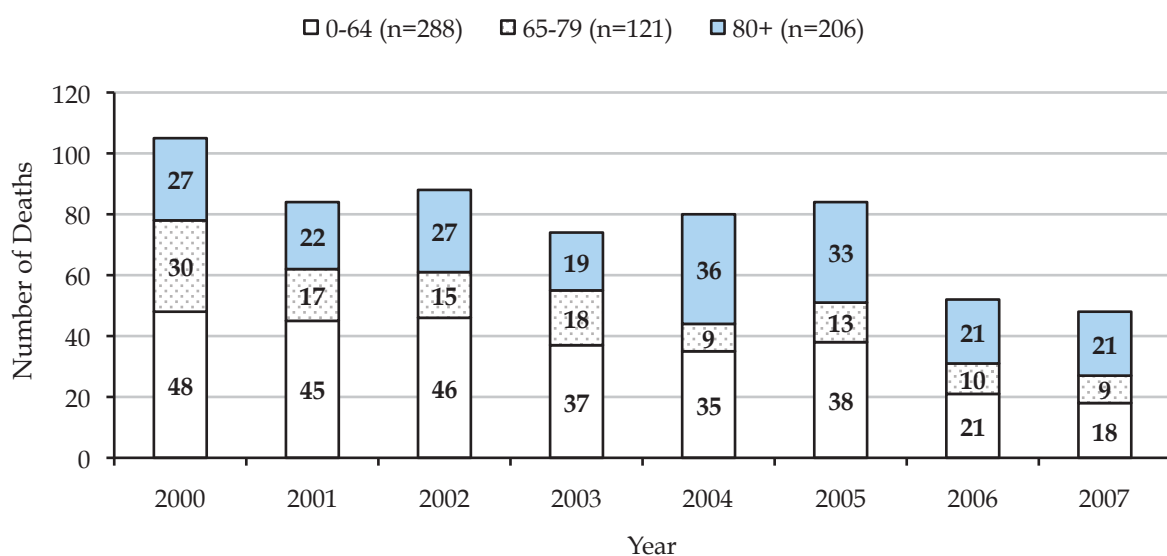
Data Source: CY2006-2008 Massachusetts Inpatient Hospital Discharge Database. Accessed at MassCHIP v.3.00 r324, Massachusetts Department of Public Health.



Asthma Mortality

Deaths due to asthma are rare in Massachusetts. Even so, each death that does occur is potentially avoidable. A death due to asthma is often indicative of missed opportunities for appropriate asthma diagnosis, management and treatment. From 2000 through 2007, there were a total of 615 deaths due to asthma in the Commonwealth; over half (53.2%) were among adults aged 65 and older. Of those, 63.0% (n=206) were among adults aged 80 and older (Figure 6).

Figure 6. Number of Deaths Due to Asthma by Age, Massachusetts, 2000-2007



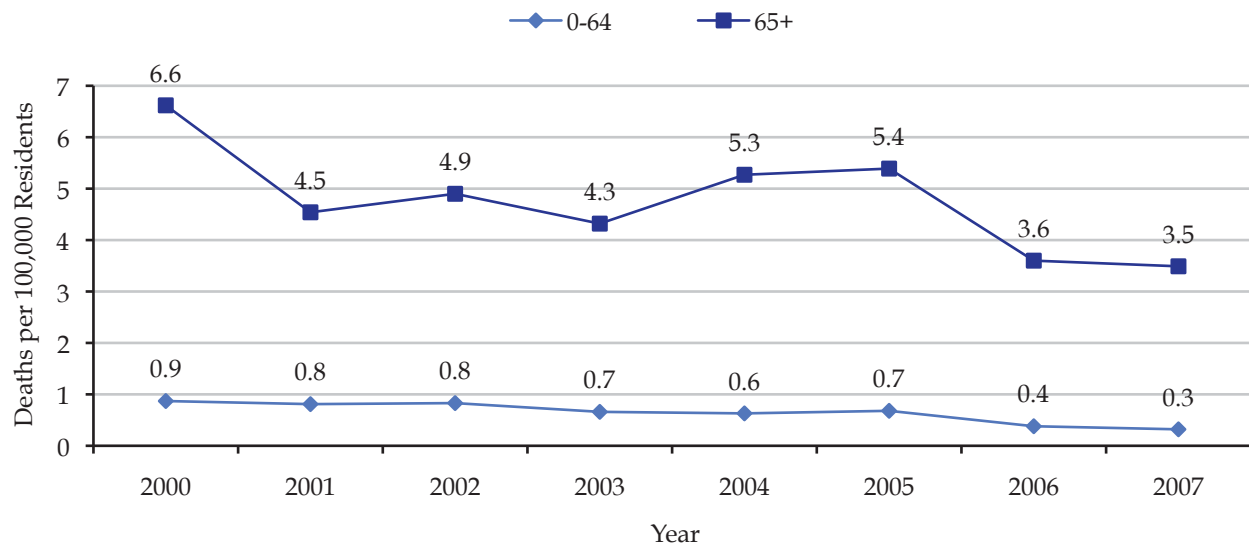
Data Source: 2000-2007 Massachusetts Registry of Vital Records and Statistics. Accessed at MassCHIP v.3.00, r324, Massachusetts Department of Public Health.

A death due to asthma is often indicative of missed opportunities for appropriate asthma diagnosis, management and treatment.

Although the asthma mortality rate among older adults in Massachusetts is declining, it is consistently higher than the rate among younger residents. From 2000 through 2007, the asthma mortality rate among adults aged 65 and older significantly decreased by 5.9% per year. Despite this, the rate among older adults remained significantly higher than the rate for all other ages during this time period (Figure 7).

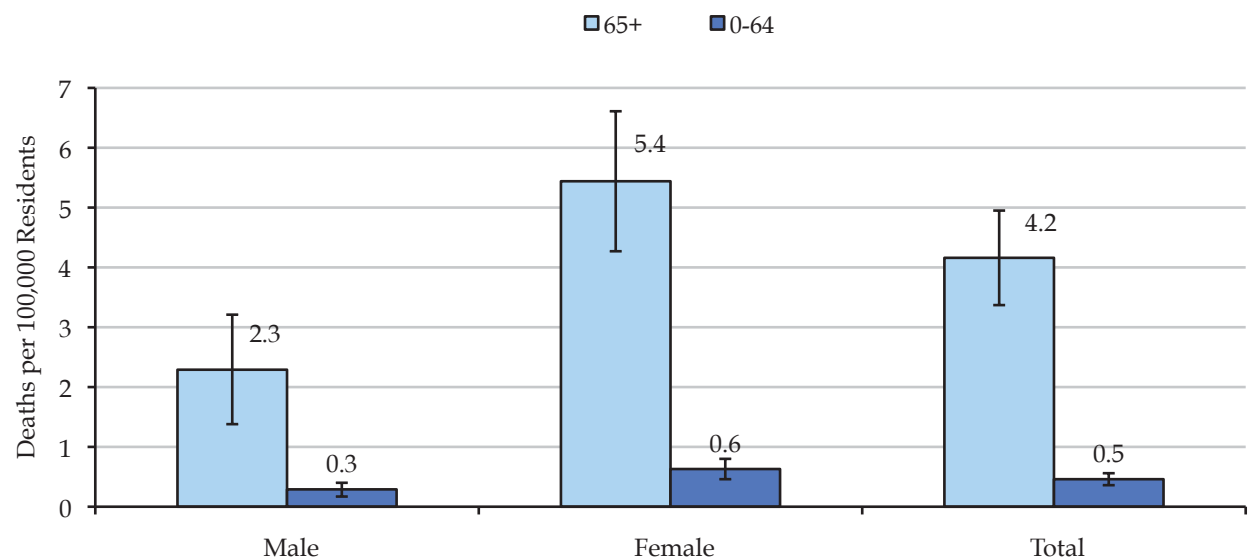
During the period 2005 through 2007, the average annual asthma mortality rate for adults aged 65 and older in Massachusetts was 4.2 per 100,000 population (Figure 8), which was not significantly different

Figure 7. Asthma Mortality Rate by Age, Massachusetts, 2000-2007



Data Source: 2000-2007 Massachusetts Registry of Vital Records and Statistics. Accessed at MassCHIP v.3.00, r324, Massachusetts Department of Public Health.

Figure 8. Three-year Average Annual Asthma Mortality Rate by Sex and Age, Massachusetts, 2005-2007



Note: Error bars are 95% Confidence Intervals.

Data Source: 2005-2007 Massachusetts Registry of Vital Records and Statistics. Accessed at MassCHIP v.3.00, r324, Massachusetts Department of Public Health.

from the US rate (4.7 per 100,000). The asthma mortality rate for older Massachusetts adults was 8.4 times the rate for younger persons and, among older adults, the rate for females was nearly 2.4 times the rate for males (Figure 8). Also worth noting, the rate for those aged 80 and older was nearly 5 times the rate for those aged 65-79 (9.0 vs. 1.8 per 100,000). The numbers were too small to allow for meaningful comparisons of mortality by race/ethnicity.



Conclusion

The information presented in this bulletin highlights the disparate burden of asthma experienced by Massachusetts residents aged 65 and older. Not only is asthma prevalence for this group increasing, but only 1 in 5 older Massachusetts adults with asthma has well-controlled asthma. Additionally, while the rate of asthma hospitalization for younger adults has remained stable, the rate for older adults is significantly increasing, and older adults account for more than half of the deaths due to asthma in the Commonwealth.

These statistics combined with the large and growing number of older adults in Massachusetts underline the need for effective interventions for older adults with asthma. The *Strategic Plan for Asthma in Massachusetts 2009 – 2014* highlighted older adults as a group that needs increased clinical and public health attention.⁸ While the current asthma treatment guidelines from the National Institutes of Health apply to all people with asthma, older adults may need special consideration due to comorbid conditions, polypharmacy, and changes due to normal aging.^{1,5}

State specific recommendations for improving asthma outcomes among older adults should be developed. In the Strategic Plan, the Massachusetts Department of Public Health's Asthma Prevention and Control Program and the New England Chapter of the Asthma and Allergy Foundation committed to convening a taskforce of stakeholders to develop such recommendations. The taskforce will include older adults with asthma, as well as stakeholders who work with this population, such as elder affairs, internal or geriatric healthcare providers, and community-based organizations. In the coming years, this taskforce will review the data presented in this bulletin and relevant clinical and public health research to make its recommendations.



Appendices

TECHNICAL NOTES

Prevalence

Behavioral Risk Factor Surveillance System (BRFSS) This population-based random telephone survey is a commonly accepted source for information on a variety of health topics. The BRFSS is administered to adults aged 18 years and older throughout the US. US estimates presented here include District of Columbia, Guam, Puerto Rico and US Virgin Islands. State results can be compared with national estimates. In Massachusetts, the survey is conducted in English, Spanish and Portuguese. Adults with current asthma were defined as those respondents who reported that in their lifetime a healthcare provider told them that they have asthma and answered “yes” to: Do you still have asthma? The **BRFSS Asthma Call-back Survey** is a standardized questionnaire on asthma developed by the CDC. Respondents to the BRFSS who reported that they have ever been diagnosed with asthma and agreed to participate were called back within 2 weeks and administered the survey. Percentages were weighted to the total Massachusetts population for the corresponding year in order to reflect both the probability that an individual is selected to participate in the survey and the differential participation by sex, age, and race/ethnicity.

Hospitalizations

Massachusetts Statewide Hospital Database Data on hospitalizations due to asthma were from the Massachusetts Inpatient Hospital Discharge Database, maintained by the Massachusetts Division of Health Care Finance and Policy. An asthma hospitalization was defined as any case having an International Classification of Disease, (ICD-9-CM) diagnosis code of 493.0-493.9 assigned to the primary diagnosis field. The Community Health Network Area (CHNA) effort was established by MDPH in 1992. Today this initiative includes all 351 Massachusetts towns and cities, each of which is located within one of the 27 CHNAs. Each CHNA collaboratively identifies local and regional health priorities, designs community-based prevention plans, and tracks success in achieving healthier communities. Where indicated, data were obtained using MDPH’s Massachusetts Community Health Information Profile (MassCHIP), v.3.00, r324, 8/2010. Data consideration: In FY2007, the Division of Health Care Finance and Policy implemented new regulations for the collection and coding of race and ethnicity data in hospital records. Due to issues related to the introduction of these new methods in Massachusetts hospitals, the numbers (and therefore the rates) of hospitalizations among Hispanics for the last quarter of CY2006 and the first quarter of CY2007 are likely underestimates. This should be taken into consideration when interpreting the individual year rates, as well as the three-year average annual rates.

National Hospital Discharge Survey (NHDS) National data on hospitalizations due to asthma were available from the NHDS annual data reports. The NHDS is a national

probability survey conducted annually which collects information on inpatients from a sample of non-Federal short-stay hospitals in the United States. Hospitalizations due to asthma are defined as discharges of inpatients by first-listed ICD9-CM diagnosis code of 493. Counts and rates by age were available for each year 2000-2006. Rates were calculated using US Census Bureau estimates of the civilian population based on 2000 census. NHDS annual data reports available from the National Center for Health Statistics at: http://www.cdc.gov/nchs/nhds/nhds_products.htm.

Mortality

Massachusetts Registry of Vital Records and Statistics Data on deaths due to asthma were from records maintained by the Registry of Vital Records and Statistics within the Massachusetts Department of Public Health. An asthma death was defined as any case with an ICD-10 code between J45-J46 in the underlying cause of death field. Data were obtained using MDPH's Massachusetts Community Health Information Profile (MassCHIP), v.3.00, r324, 8/2010.

National Vital Statistics System (NVSS) National data on deaths due to asthma were from the NVSS, the Federal compilation of data on deaths collected and published according to state and Federal mandates. The NVSS is the result of the cooperation between the National Center for Health Statistics and the States to provide access to statistical information from death certificates. An asthma death was defined as any case with an ICD-10 code between J45-J46 as the underlying cause of death. Rates were calculated as three-year annual averages to obtain stable estimates using population estimates obtained from the US Census Bureau. For more information on the NVSS, go to: <http://www.cdc.gov/nchs/deaths.htm>.

Population

Modified Age, Race, Sex (MARS) Estimates, National Center for Health Statistics (NCHS) NCHS releases bridged-race population estimates of the resident population of the United States, based on Census 2000 counts, for use in calculating vital rates. These estimates result from bridging the 31 race categories used in Census 2000, as specified in the 1997 Office of Management and Budget (OMB) standards for the collection of data on race and ethnicity, to the four race categories specified under the 1977 standards. The bridged-race population estimates are produced under a collaborative arrangement with the US Census Bureau. Each year, the Massachusetts Department of Public Health (MDPH) downloads the MARS file from NCHS and customizes it for the needs of the Department. In this report, these files were used as denominators of hospitalization and death rates. MARS files available at http://www.cdc.gov/nchs/nvss/bridged_race.htm.

Statistical Significance

In this bulletin, the term "significant" is used to describe statistically significant differences when comparing two estimates or examining trends over time. Since the data presented are estimates, there is some margin of error associated with these estimates; confidence intervals (CI) provide a measure of how large that margin of error is. In this bulletin, 95% CIs are presented; this means that the true value of the estimate falls within the range

given by the confidence interval 95% of the time. CIs help determine whether a difference between two groups is statistically significant. When comparing two estimates, if the 95% CIs for the two estimates do not overlap, the difference between the estimates is considered to be statistically significant. For examining the statistical significance of trends over time, regression analysis (Joinpoint or Poisson) was performed and annual percent change was calculated. A p-value of <0.05 was considered statistically significant. Analyses were performed using SAS v. 9.2.

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