HEALTH OF BOSTON 2023

THE ASTHMA REPORT

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FOREWORD

Welcome to the Boston Public Health Commission's (BPHC) Health of Boston: The Asthma Report. This is part of a series of reports providing disease-specific surveillance data on the health of Boston. This report aims to provide residents, medical and public health professionals, health policy makers, and community advocates with actionable information on the asthma experience of Boston residents.

The report highlights trends in asthma prevalence, emergency department visits, and hospitalizations. Data sources include the US Census, death registries, hospital inpatient discharge databases and surveys that describe individual health conditions and behaviors. Inequities in asthma prevalence in the US population are found across sex, race/ethnicity, education, and income. This disproportionate burden of asthma can be linked with the effects of historic structural and institutional racism that have caused modern-day socioeconomic disparities across racial/ethnic groups.

Boston Public Health Commission acknowledges the role of racism in creating and perpetuating systems of oppression that undermine the social determinants of health and have resulted in the historic marginalization and subsequent inequities in health outcomes of Boston residents of color.

For many indicators, trends over time are highlighted, as well as differences across neighborhoods and between racial and ethnic groups and other subgroups (e.g., employment, education, and housing status). We hope you find the information presented here useful in your own efforts to educate, inspire, advocate, and intervene in the interest of optimal health for all Boston residents.

TABLE OF CONTENTS

INTRODUCTION

The report highlights trends in asthma prevalence, emergency department visits, and hospitalizations. Data sources include the US Census, hospital inpatient discharge databases and youth and adult health surveys that describe individual health conditions and behaviors. It is part of a series of reports providing surveillance data on the health of Boston. It aims to provide residents, medical and public health professionals, health policy makers, and community advocates with actionable information on the asthma experience of Boston residents.

What is asthma?

Asthma is a commonly occurring chronic disease of the lungs affecting approximately 1 in 13 people in the US (1). Asthma is characterized by repeated episodes of wheezing, breathlessness, chest tightness, and evening or early morning coughing (2). Symptoms often occur in response to exposure to triggers, which include allergens (e.g., mold, pet dander, dust mites, and cockroaches), certain chemicals, tobacco smoke, or infections. Asthma can be controlled by adhering to prescribed medication, avoiding triggers, and engaging in other reduction practices, such as developing an asthma action plan with a health care provider.

Populations at increased risk for asthma:

Disparities in asthma prevalence in the US population are found across sex, race/ethnicity, education, and income. Data from the 2021 National Health Interview Survey (NHIS) shows that adult women (9.7%) are more likely to report currently having asthma than adult men (6.2%). Among adults ages 18 and over in the US, Black non-Hispanic/Latinx adults (10.6%) had a higher asthma prevalence compared to White non-Hispanic/Latinx adults (8.2%) and Hispanic/Latinx adults (5.8%) (3). Disparities in asthma are also observed across the social determinants of health (SDOH), including education and income. According to the national Behavioral Risk Factor Surveillance System (BRFSS) in 2020, US adults who did not finish high school (9.9%) had a higher asthma prevalence than adults who graduated from high school (8.7%) or college (7.9%) (4). Similarly, in 2020, adults with lower incomes, including those in the lowest income bracket of $15,000 or lower were more likely (13.8%) to have asthma compared to those in the higher income bracket of $75,000 or greater (7.8%) (4).

Among youth, inequities in asthma prevalence by race/ethnicity were notable. According to 2019 national Youth Risk Behavior Survey data, Black youth (29.2%), Asian youth (22.6%), and Hispanic/Latinx youth (21.0%) had a higher prevalence of asthma compared to White youth (19.8%) (5).

Prevention of asthma

While asthma is a chronic illness, the risk of experiencing an attack can be controlled by avoiding asthma triggers and seeking proper medical care. To help people with asthma achieve better health and control their symptoms, CDC's National Asthma Control Program (NACP) developed EXHALE, a set of six strategies to reduce asthma-related hospitalizations and emergency department visits (6). The strategies include: 1) Education on asthma self-management, such as how to use asthma medications correctly and manage conditions when symptoms worsen, 2) Extinguishing smoking and exposure to secondhand smoke 3) Home visits for trigger reduction and asthma self-management education, 4) Achievement of guidelines-based medical management, 5) Linkages and coordination of care across settings, and 6) Environmental policies or best practices to reduce asthma triggers from indoor, outdoor, or occupational sources, including comprehensive smokefree policies.

Racism and asthma

In the US, the risk of being diagnosed with asthma and experiencing an asthma-related emergency department visit or hospitalization is highest for Black non-Hispanic/Latinx individuals when compared with other racial/ethnic groups. This disproportionate burden of asthma can be linked with the effects of historic structural and institutional racism and systems of oppression such as redlining and exclusionary or land-use zoning (7). These unfair housing practices have resulted in the neighborhoods and communities where Black and Hispanic/Latinx individuals have increased exposures to risk factors for asthma including more crowded housing, inferior or aging heating, ventilating, and air conditioning (HVAC) systems, increased exposure to allergens and pollutants from traffic and factory exhaust along with poor access to healthcare and little information on how to recognize and manage the symptoms of asthma (7, 8). Ultimately, this causes disparities across asthma prevalence and asthma outcomes, including rates of hospitalizations and emergency department visits.

The Asthma and Allergy Foundation of America developed a framework acknowledging the root causes of asthma disparities in the US, citing the relationship between structural determinants (i.e., racism and discrimination, socioeconomic and political context) and social determinants (physical and social environment, education, and economic stability) as the leading drivers to asthma disparities (9). The model highlights the "overwhelming role of race and ethnicity in

amplifying social, structural, and individual stressors" (9). In addition to increased exposure to asthma allergens and triggers, the impact of inequities in housing and neighborhoods can also lead to unequal access to health care and services, which can create disparities in individuals' ability to manage their asthma symptoms (10).

COVID-19 and asthma

Early in the COVID-19 pandemic, the CDC hypothesized that individuals with moderate-to-severe asthma or uncontrolled asthma were more likely to experience severe symptoms and complications from COVID-19 and therefore were more likely to be hospitalized from COVID-19 (11). As the pandemic progressed, a growing body of research questioned this hypothesis and suggested that people with moderate to severe asthma may not be more likely to experience severe COVID-19 outcomes when compared to non-asthma individuals. One clinical commentary review published in 2022 found no increased risk among children and adults with asthma who become infected with COVID-19 with regard to severity of disease progression (12). While asthma was not consistently linked to more severe COVID-19 risk, the review noted that other risk factors (also commonly associated with asthma) may be linked with COVID-19 morbidity and mortality, including race/ethnicity, sex, obesity, and active smoking. The literature is supported by the American Academy of Allergy, Asthma, and Immunology, who as of June 2022 corroborated that there was no published data to support the assertion that individuals with moderate-to-severe asthma were at greater risk of experiencing more severe COVID-19 (13). Although the CDC is currently updating its COVID-19 guidance, as of the release of this report, the CDC still lists moderate to severe or uncontrolled asthma as a risk factor for severe illness for COVID-19.

METHODS

This report presents data related to asthma among Boston residents from 2015 to 2021 derived mainly from four data sources: (1) Boston youth asthma prevalence data are from the Youth Risk Behavior Survey (Boston Public Schools and Centers for Disease Control and Prevention) (Boston YRBS); (2) Boston adult asthma prevalence data are from the Boston Behavioral Risk Factor Surveillance System (Boston BRFSS), Boston Public Health Commission (BPHC), (3) Boston adults experiencing homelessness asthma prevalence data are from the Health of Boston Survey of People Experiencing Homelessness, BPHC and (4) Boston resident asthma emergency department visits and hospitalizations are from the acute hospital case-mix databases, Massachusetts Center for Health Information and Analysis (CHIA).

Asthma youth prevalence data from the Boston YRBS are derived from random sample surveys administered approximately every other year as specified from 2017 to 2021. The resulting data

from the past three survey years were adjusted (i.e., weighted) to permit generation of rates (i.e., percentages) that represent the entire Boston Public High School population. In some cases, survey data for multiple years were combined to increase stability of estimates. Logistic regression was used to determine the direction of change over time (i.e., increasing, decreasing, or stable) and for comparing two demographic groups within a given time period (p<.05).

Asthma adult prevalence data from the Boston BRFSS are derived from random sample surveys with approximately 3,000 respondents administered approximately every other year as specified from 2015 to 2021. The resulting data from the past four survey years were adjusted (i.e., weighted) to permit generation of rates (i.e., percentages) that represent the entire Boston resident population of adults living in households. In some cases, survey data for multiple years were combined to increase stability of estimates. Logistic regression was used to determine the direction of change over time (i.e., increasing, decreasing, or stable) and for comparing two demographic groups within a given time period (p<0.05).

Emergency department and hospital patient encounters within this report are age-adjusted to permit comparisons that account for the impact of differences in age distributions of their respective underlying populations. The resulting comparisons allow consideration of observed differences in terms of factors other than population age differences. Age specific results are also provided.

For Boston emergency department and hospitalization comparisons, rate change over time for the last five years (2017-2021) and rate differences between two demographic groups for the most recent year or time period were assessed using statistical procedures. Whether emergency department and hospitalization rates increased or decreased was determined by assessing linear change across the entire 5-year time period using Poisson regression (p<0.05).

Similarly, a rate for a given demographic group is described as higher or lower than the comparison group (i.e., reference group) only when the comparison test indicated statistical significance (p<0.05). When two rates were compared and the difference was not found to be statistically significant, the two rates were described as "similar" if mentioned in text. Demographic group differences for asthma hospitalizations and mortality were based on a comparison of single-year rates for the most recent data year, 2021.

Boston population data used as denominators in the rate calculations were produced internally by the BPHC Population Health and Research Boston Population Estimates Project (B-PEP). B-PEP uses 2010 and 2020 US Census data and 2019 American Community Survey (ACS) data for Boston to generate population estimates for years between the 2010 and 2021 censuses via

interpolation and extrapolation of age, race/ethnicity, sex, and neighborhood population change from 2010 to 2020. For more information on B-PEP, please contact the BPHC Population Health and Research office. Of note, B-PEP population estimates will be revised when the US Census Bureau releases further stratified 2020 population data.

All racial and ethnic designations except those from some hospital discharge data and some emergency department data are self-reported. Several cautions should be kept in mind when using data reported by race/ethnicity. Race and ethnicity are social constructs, not biological facts. There is often more genetic variation between members of the same race than between members of different races. In addition, the meanings of these designations are highly subject to historical, cultural, and political forces. Not only do these designations change over time, but there is also a very subjective element that influences who is considered a member of one group or another. The concept of race can be notably broad: the term "Black," for example, includes people describing themselves as African American, African diaspora, or Caribbean, groups with distinct histories and differing health risks. Nevertheless, racial designations are useful in that they are nearly universally used by people in the United States to describe themselves, and they permit us to identify and address health inequities that exist across racial and ethnic groups.

In order to identify these inequities racial/ethnic group comparisons involved using White residents as the reference group and assessing the difference between each non-White resident group rate (e.g., rate for Black residents) and the White resident (reference group) rate. For sex-based comparisons, males are the reference group. Neighborhood comparisons involved assessing the difference between a given neighborhood's rate and the rate for the rest of Boston (those residents not living in the specified neighborhood). These comparisons are considered more accurate than comparisons to Boston overall.

Latinx people can be of any race. In this report, data for persons of Hispanic and/or Latin descent are described as Latinx and presented alongside non-Latinx racial groups. Boston-specific data by race and Latinx ethnicity is presented for non-Latinx Asian residents, non-Latinx Black residents, non-Latinx White residents, and Latinx residents of any race. Few sources have data in large enough counts to allow presentation of data such as the many ethnicities included under the category "Asian." Additionally, small survey sample size and case numbers limited our ability to identify and describe health disparities for Indigenous people.

For additional information regarding the analytical methods used within this report, please contact the Boston Public Health Commission Population Health and Research (PHAR) Office at populationhealth@bphc.org.

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SECTION 1. YOUTH ASTHMA PREVALENCE

Figure 1. Asthma Among Public High School Students by Year, 2017, 2019, 2021
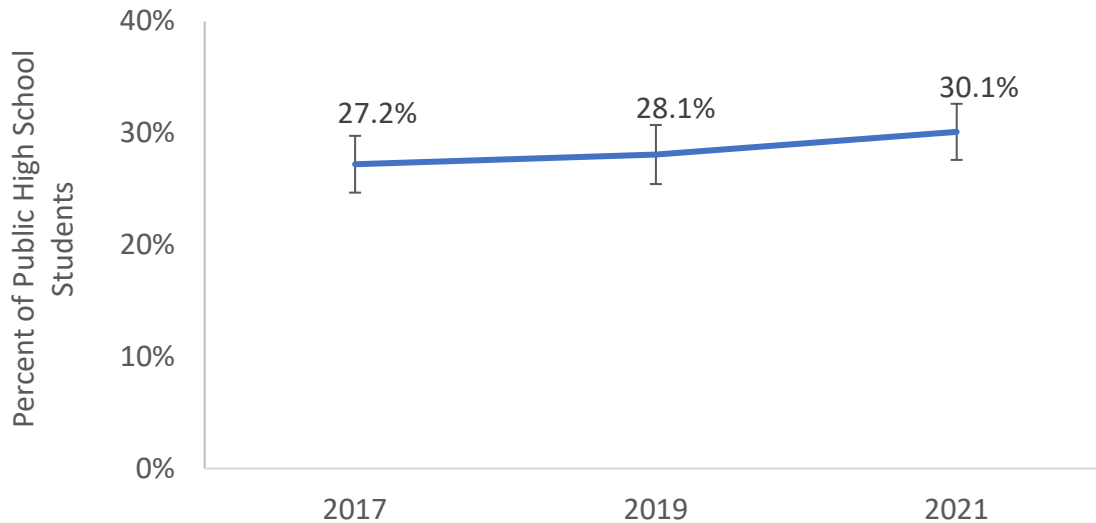
DATA SOURCE: Youth Risk Behavior Survey (2017, 2019, 2021), Centers for Disease Control and Prevention and Boston Public Schools

In 2021, 30.1% of Boston public high school students reported having asthma.

Please note the BPHC may utilize different methodology than the CDC when computing prevalence estimates which could yield slightly different results as disseminated from Boston Public Schools (BPS). Specifically, BPHC assesses item non-response (i.e., those who respond "don't know" or "refused to answer") but typically excludes these from consideration when calculating point estimates (i.e., percentages). For further explanation of observed differences and applied analytical methods please contact populationhealth@bphc.org.

Figure 2. Asthma Among Public High School Students by Selected Demographics, 2021

* Statistically significant difference when compared to reference group
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Youth Risk Behavior Survey (2021), Centers for Disease Control and Prevention and Boston Public Schools

In 2021, 30.1% of Boston public high school students reported having asthma. The percentage of Boston public high school students with asthma was higher for Latinx students (33.3%), Asian students (32.2%), and Black students (28.2%) compared with White students (20.2%).
The percentage of Boston public high school students with asthma was lower for foreign-born students who have lived in the United States for less than 6 years (14.6%) compared with students who were born in the United States (32.8%).

Figure 3. Asthma Among Public High School Students by Race/Ethnicity and Sex, 2017, 2019 and 2021 Combined

* Statistically significant difference when compared to reference group
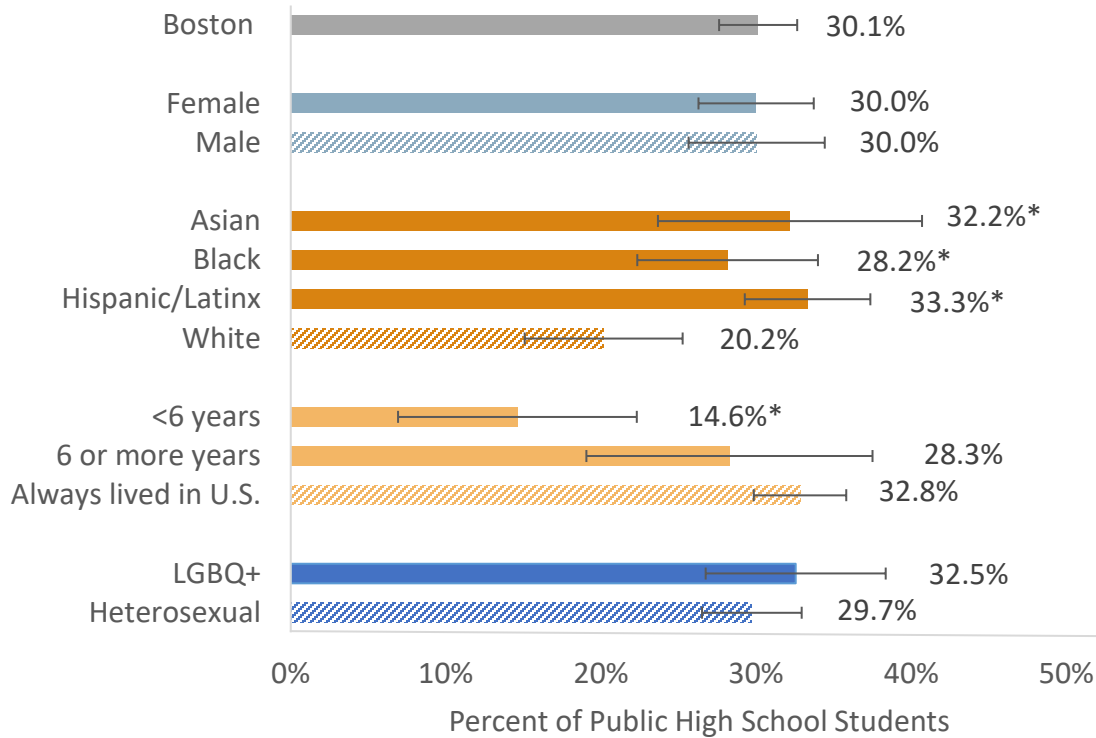NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Youth Risk Behavior Survey (2017, 2019, 2021), Centers for Disease Control and Prevention and Boston Public Schools

For 2017, 2019, and 2021 combined, a higher percentage of Asian female (30.0%) and Latinx female students (29.3%) had asthma compared with White female students (20.9%). A higher percentage of Black male (28.4%), Asian male (30.8%) and Latinx male students (30.9%) had asthma compared with White male students (20.2%).

SECTION 2. ADULT ASTHMA PREVALENCE

Figure 4. Asthma Among Adults by Year, 2015-2021

DATA SOURCE: Boston Behavioral Risk Factor Surveillance System (2015, 2017, 2019, 2021), BPHC

In 2021, 13.1% of Boston adult residents reported having asthma**.** By comparison, 11.7% of adults in Massachusetts and 9.8% of adults in the United States reported having asthma. The percentage of adults with asthma was similar from 2017 to 2021.

Figure 5. Asthma Among Adults by Selected Demographics, 2017, 2019, 2021 Combined

Boston — 11.2%

Asian — 3.6%
Black — 13.6%*
Latinx — 12.0%
White — 10.8%

Female — 14.8%*
Male — 7.4%

<=10 years in U.S. — 4.6%*
10+ years in U.S. — 9.0%*
Always lived in U.S. — 13.6%

LGBTQ — 16.1%*
Non-LGBTQ — 10.6%

Boston Housing Authority (BHA) Resident — 17.1%*
non-BHA Rental Assisted Renter — 22.9%*
Non-RA Renter — 10.1%
Non-Renter Non-Owner — 13.7%*
Home Owner — 8.8%

Ages 18-24 — 9.0%
Ages 25-44 — 9.5%*
Ages 45-64 — 14.9%*
Ages 65+ — 12.5%

Out of Work — 12.4%
Homemaker — 9.2%
Student — 8.4%
Retired — 11.9%*
Unable to Work — 25.5%*
Employed — 9.8%

Less than $25,000 — 14.2%*
$25,000-$49,999 — 10.3%
$50,000 or more — 10.3%

< High School Grad — 11.9%
High School Grad — 12.3%
Some College + — 10.8%

Percent of Adults

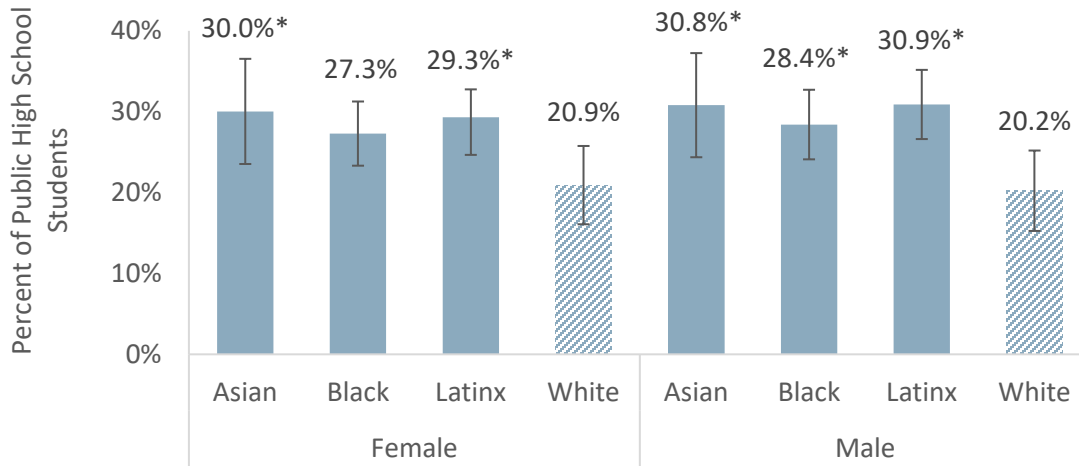* Statistically significant difference when compared to reference group
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Boston Behavioral Risk Factor Survey (2017, 2019, 2021), BPHC

Boston Public Health Commission

In 2017, 2019, 2021 combined, 11.2% of Boston adult residents reported having asthma.

The percentage of residents with asthma was higher for the following groups:

- Black (13.6%) adults compared with White adults (10.8%)

- Female (14.8%) adults compared with Male adults (7.4%)

- Adults who were unable to work (25.5%) and retired (11.9%) compared with adults who were employed (9.8%)

- Adults living in households with an annual income of less than $25,000 (14.2%) compared with adults living in households with an annual income of $50,000 or more (10.3%)

- Adults who were Boston Housing Authority residents (17.1%), Non-renter non-owners (13.7%) and renters who received rental assistance (22.9%) compared with adults who owned a home (8.8%)

- Adults who were LGBTQ (16.1%) compared with adults who were non-LGBTQ (10.6%)

- Adults ages 45-64 (14.9%) compared with adults ages 65+ years old (12.5%)

The percentage of adults with asthma was lower for the following groups:

- Foreign-born adults who lived in the United States for less than or equal to 10 years (4.6%) and foreign-born adults who lived in the United States for over 10 years (9.0%) compared with those who were born in the United States (13.6%)

- Adults ages 25-44 (9.5%) compared with adults ages 65+ years old (12.5%)

Figure 6. Asthma Among Adults by Race/Ethnicity and Sex, 2017, 2019, 2021 Combined

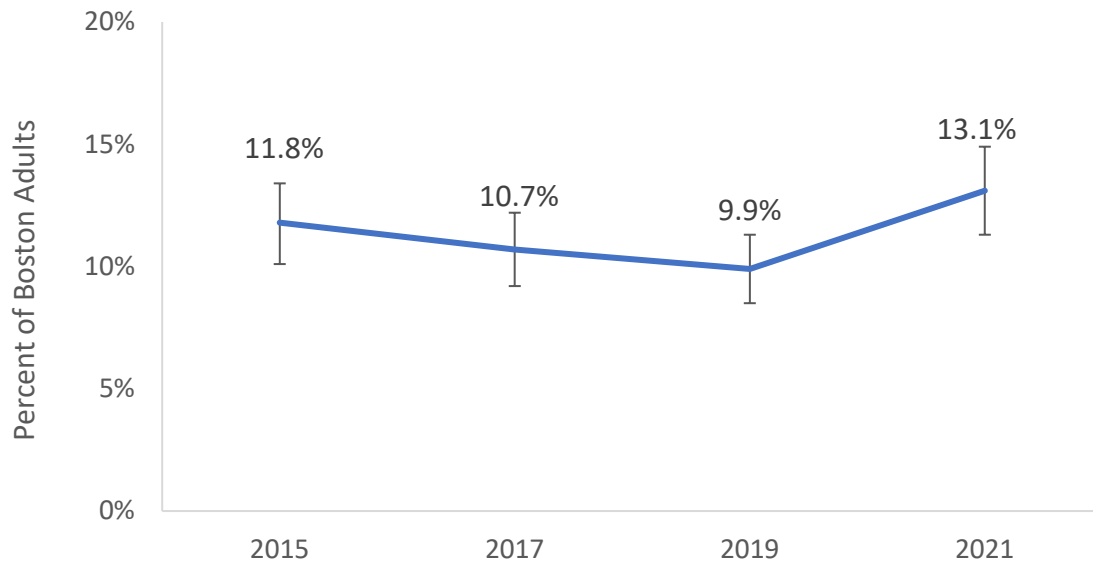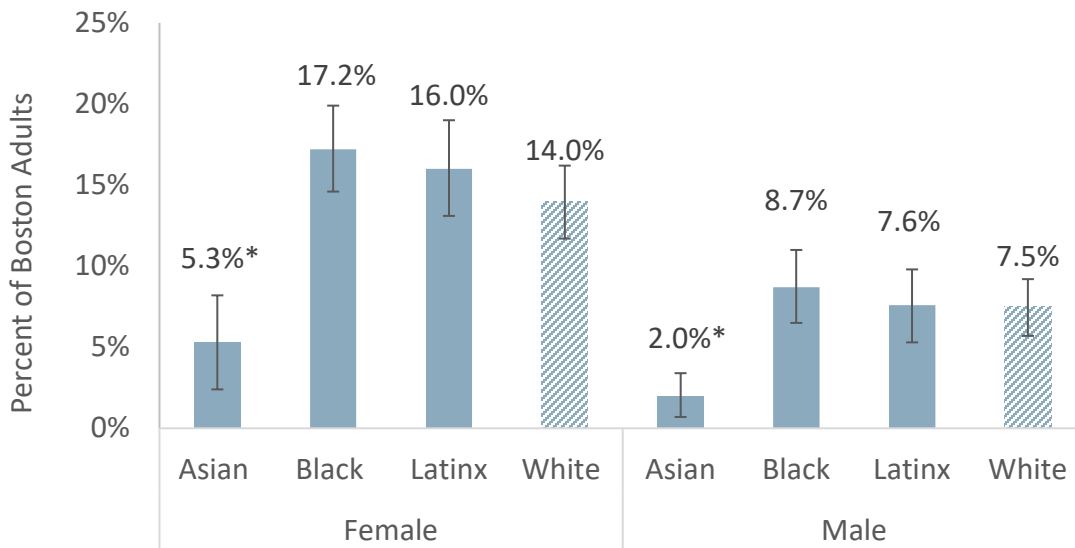* Statistically significant difference when compared to reference group
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Boston Behavioral Risk Factor Surveillance System (2017,2019,2021), BPHC

In 2017, 2019, and 2021 combined, a lower percentage of Asian (5.3%) female adults had asthma compared with White female adults (14.0%). A lower percentage of Asian male adults (2.0%) had asthma compared with White male adults (7.5%).

Figure 7. Asthma Among Adults by Neighborhood, 2017, 2019, and 2021 Combined

Percent of Boston Adults
with Asthma
11.2% (10.4-12.1)

CH
11.7%
(5.9 -17.5)

EB
9.1%
(6.2 -12.1)

A/B
9.0%
(6.2 - 11.8)

BB
7.9%
(4.7 -11.0)

FW
9.1%
(4.2 -14.0)

SE
17.4%
(12.2 - 22.5)

SB
8.7%
(4.9 - 12.5)

RX
14.4%
(10.9 - 18.0)

DOR (02121, 02125)
13.2%
(10.3 - 16.0)

JP
9.3%
(5.9 - 12.6)

DOR (02122, 02124)
13.4%
(11.1 - 15.7)

WR
8.0%
(5.3 - 10.7)

RS
13.2%
(9.3 - 17.1)

MT
11.6%
(7.5 - 15.8)

HP
11.3%
(7.7 - 15.0)

N

Legend

Lower than rest of Boston

Similar to rest of Boston

Higher than rest of Boston
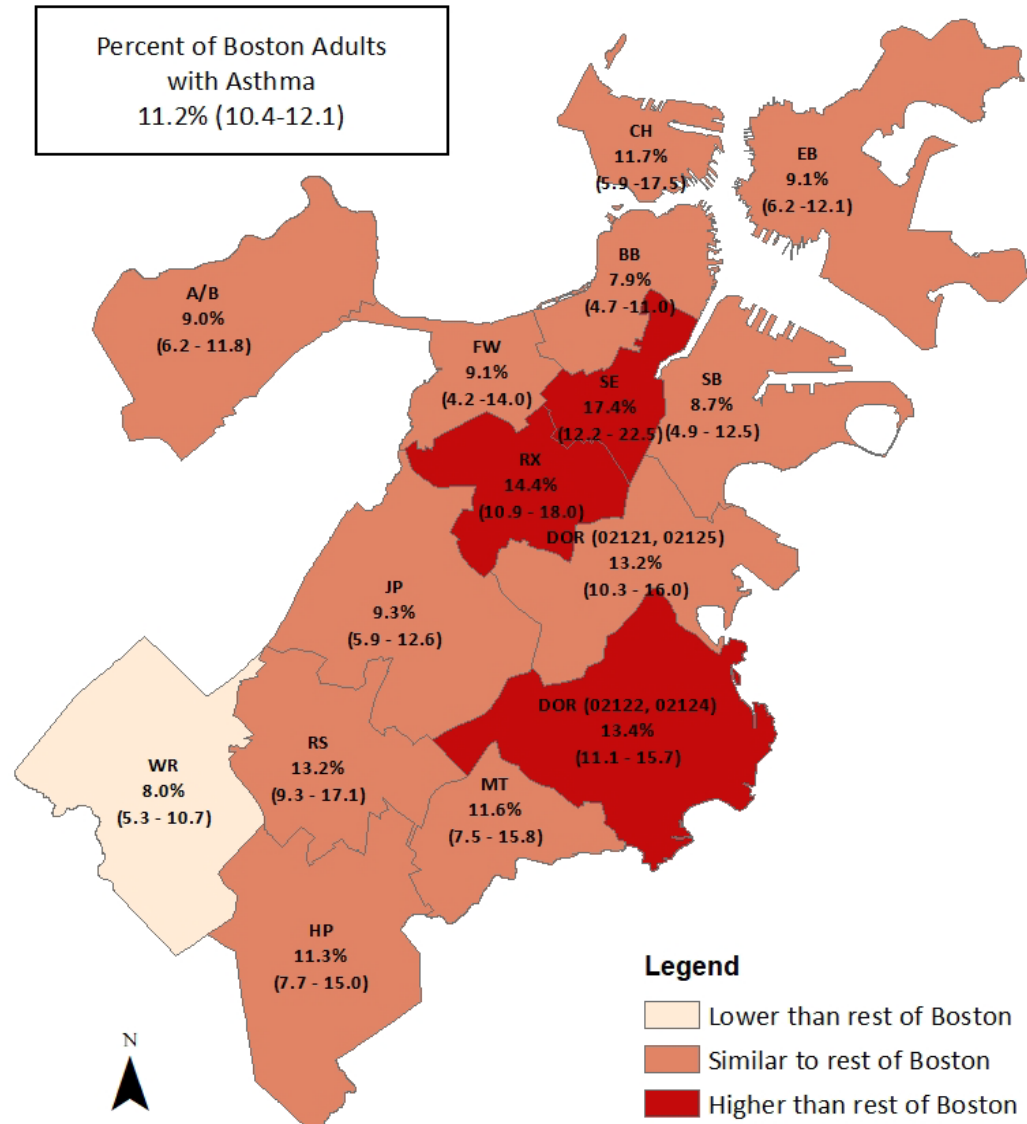
DATA SOURCE: Boston Behavioral Risk Factor Survey (2017, 2019, 2021), BPHC
Shading in map based on significant differences between neighborhood point estimate and rest of Boston. Thus, Back Bay has lower % asthma (7.9%) than West Roxbury (8.0%) but is considered "similar to the rest of Boston".

During 2017, 2019, and 2021 combined, the percentage of adults with asthma was higher in Dorchester (02122, 02124), Roxbury, and South End compared with rest of Boston. The percentage of adults with asthma was lower in West Roxbury.

Table 1. Asthma Among Adults by Neighborhood, Ranked in Descending Order, 2017, 2019, 2021, Combined

Neighborhood	Estimate	95% Confidence Intervals
South End (SE), 02111, 02118	17.4	(12.2 - 22.5)
Roxbury (RX), 02119, 02120	14.4	(10.9 - 18.0)
Dorchester (DOR), 02122, 02124	13.4	(11.1 - 15.7)
Dorchester (DOR), 02121, 02125	13.2	(10.3 - 16.0)
Roslindale (RS), 02131	13.2	(9.3 - 17.1)
Charlestown (CH), 02129	11.7	(5.9 -17.5)
Mattapan (MT), 02126	11.6	(7.5 - 15.8)
Hyde Park (HP), 02136	11.3	(7.7 - 15.0)
Jamaica Plain (JP), 02130	9.3	(5.9 - 12.6)
East Boston (EB), 02128	9.1	(6.2 -12.1)
Fenway (FW), 02115, 02215	9.1	(4.2 -14.0)
Allston/Brighton (AB), 02134, 02135, 02163	9.0	(6.2 - 11.8)
South Boston (SB), 02127, 02210	8.7	(4.9 - 12.5)
West Roxbury (WR), 02132	8.0	(5.3 - 10.7)
Back Bay, Downtown, Beacon Hill, North End, West End (BB), 02108-02110, 02113-02114, 02116, 02199	7.9	(4.7 -11.0)

DATA SOURCE: Boston Behavioral Risk Factor Surveillance System (2017, 2019, 2021), BPHC

Figure 8. Asthma Among Housed and Unhoused (i.e., Homeless) Adults, 2021
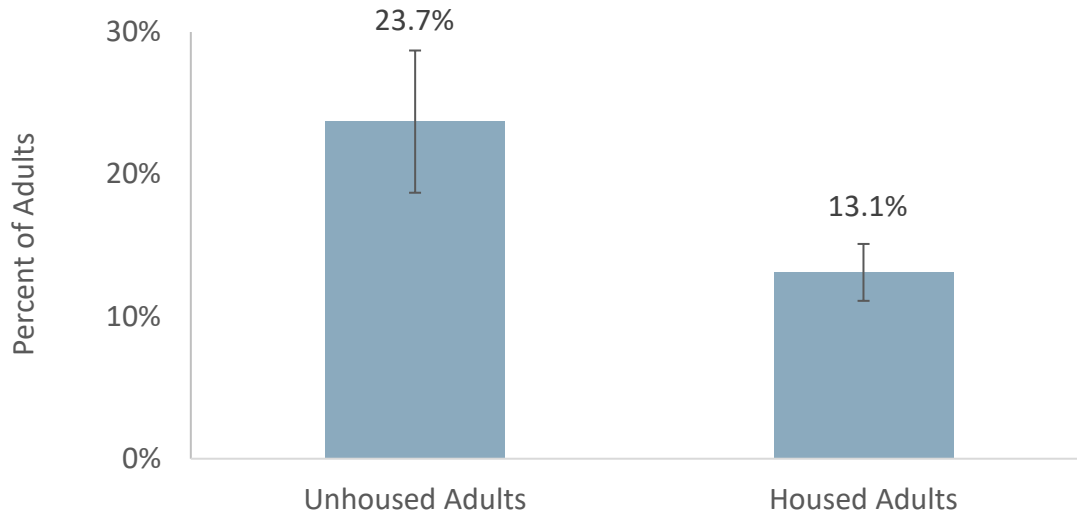
DATA SOURCES: Boston Behavioral Risk Factor Surveillance System, BPHC (2021); Health of Boston Survey of People Experiencing Homelessness, BPHC (2021)

In 2021, 23.7% of unhoused (i.e., homeless) adults had asthma compared to 13.1% of housed adults.

For more information on the health of Boston's unhoused adults, please see *Unhoused and Uncounted: Health of Boston Survey of People Experiencing Homelessness* or contact the Population Health and Research Office at populationhealth@bphc.org.

SECTION 3. ASTHMA EMERGENCY DEPARTMENT VISITS AND HOSPITALIZATIONS

Figure 9. Asthma Emergency Department Visits† by Race/Ethnicity and Year, 2017-2021
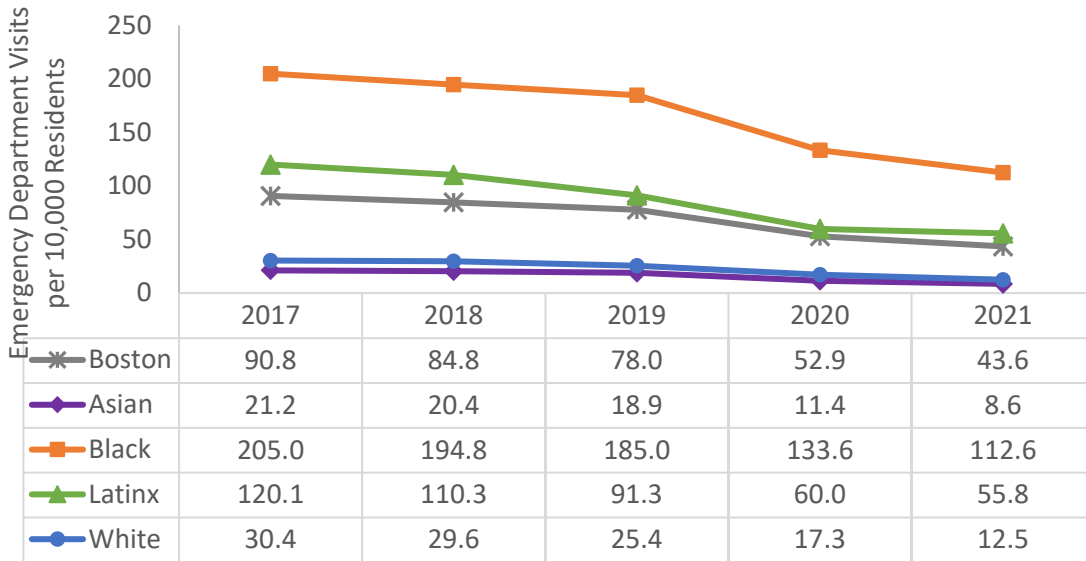
	2017	2018	2019	2020	2021
Boston	90.8	84.8	78.0	52.9	43.6
Asian	21.2	20.4	18.9	11.4	8.6
Black	205.0	194.8	185.0	133.6	112.6
Latinx	120.1	110.3	91.3	60.0	55.8
White	30.4	29.6	25.4	17.3	12.5

† Age-adjusted rates per 10,000 residents
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

From 2017-2021, the age-adjusted asthma emergency department rate per 10,000 residents decreased by 52.0% overall for Boston residents and by 58.5% for Asian residents, 44.9% for Black residents, 56.6% for Latinx residents and 57.4% for White residents.

In 2021, the asthma emergency department visit rate per 10,000 residents for Boston overall was 43.6. The rate for Black residents (112.6) and for Latinx residents (55.8) were 9.0 and 4.4 times, respectively, the rate for White residents (12.5). The rate was 36.9% lower for Asian residents (8.6) compared to White residents.

Figure 10. Asthma Emergency Department Visits† by Age and Year, 2017-2021

	2017	2018	2019	2020	2021
Ages 0-17	175.1	155.0	142.5	83.1	74.9
Ages 18-44	58.5	54.8	53.9	41.5	32.2
Ages 45-64	80.6	80.0	66.7	52.1	41.1
Ages 65+	38.1	41.2	37.9	28.4	21.6

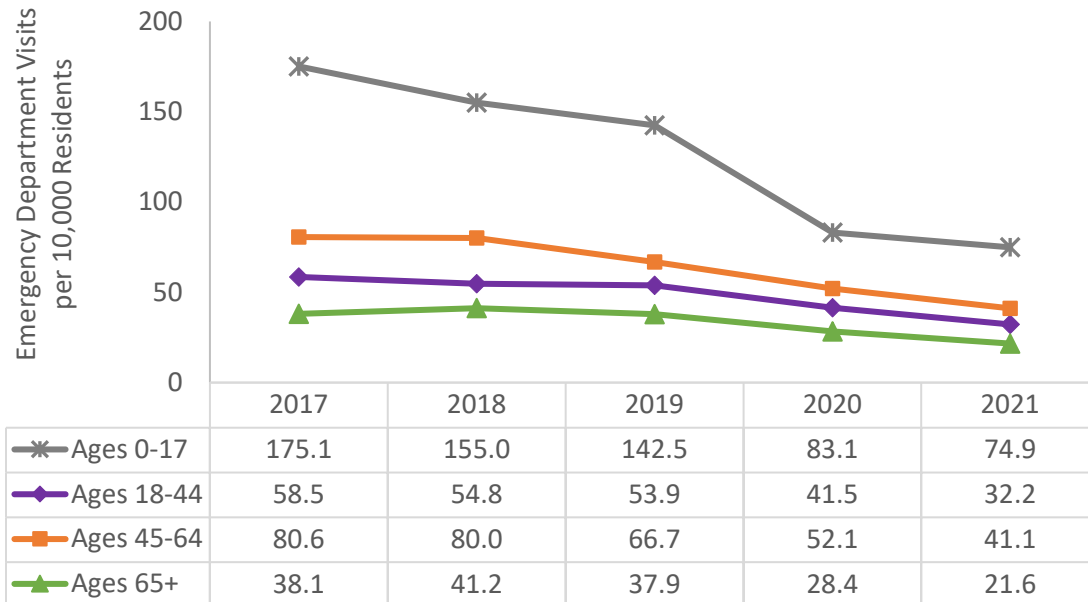(Emergency Department Visits per 10,000 Residents)

† Age-specific rates per 10,000 residents
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

From 2017-2021, the age-specific asthma emergency department visit age-specific rate per 10,000 residents decreased for all age groups: by 58.6% for residents ages 0-17 years, 42.5% for residents ages 18-44, 49.2% for residents ages 45-64, and 42.9% for residents ages 65 and over.

In 2021, the age-specific asthma emergency department visit rate for Boston residents ages 0-17 years (74.9) was 3.5 times the rate for residents ages 65 and over (21.6). The rate was 39.4% higher for residents ages 18-44 (32.2) and 62.2% higher for residents ages 45-64 (41.1) compared to residents ages 65 and over.

Figure 11. Asthma Emergency Department Visits† by Sex and Year, 2017-2021

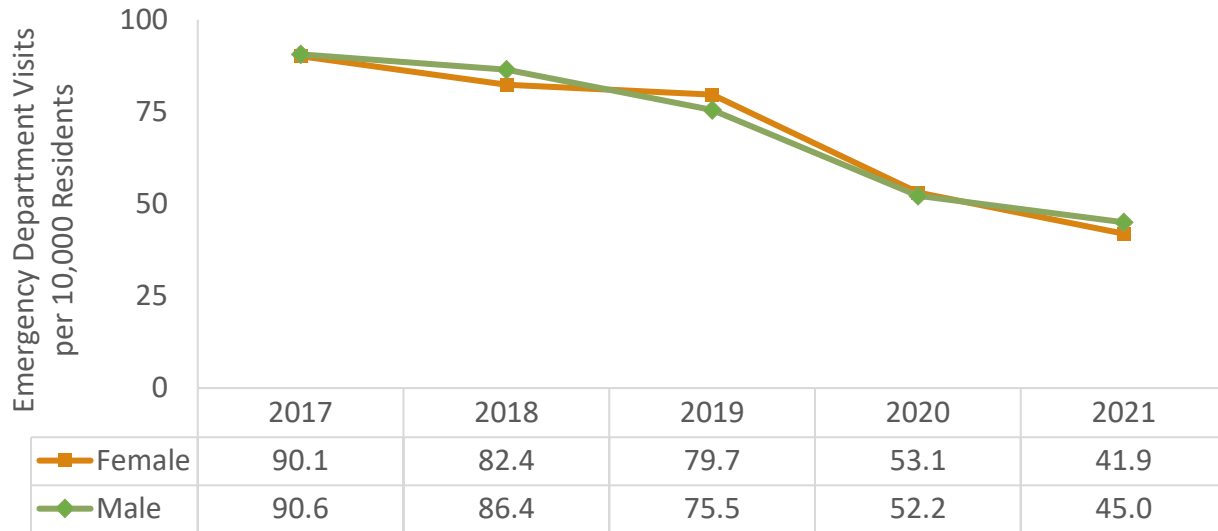|	2017	2018	2019	2020	2021
Female	90.1	82.4	79.7	53.1	41.9
Male	90.6	86.4	75.5	52.2	45.0

† Age-adjusted rates per 10,000 residents
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

From 2017-2021, the age-adjusted asthma emergency department visit rate decreased by 52.2% for female residents and 51.8% for male residents.

In 2021, the rate of asthma emergency department visits per 10,000 residents was similar for female residents (41.9) compared to male residents (45.0).

Figure 12. Asthma Emergency Department Visits† by Age and Sex, 2021
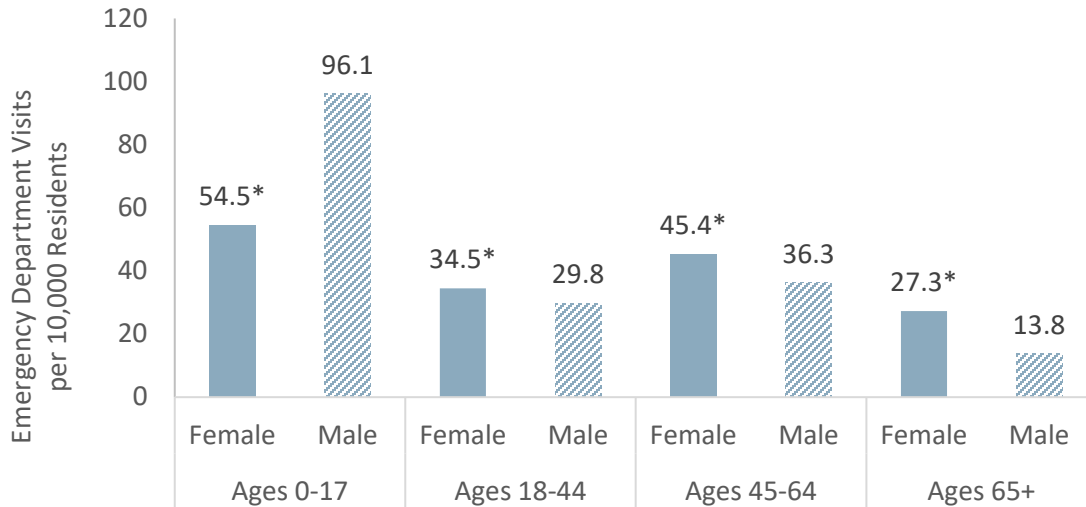
* Statistically significant difference when compared to reference group
† Age-specific rates per 10,000 residents
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

In 2021, the age-specific asthma emergency department visit rate per 10,000 residents was 43.3% lower for female residents ages 0-17 years (54.5) compared to male residents ages 0-17 (96.1).

The rate was 16.0% higher for female residents ages 18-44 (34.5) compared to male residents ages 18-44 (29.8). The rate was 25.2% higher for female residents ages 45-64 (45.4) compared to male residents ages 45-64 (36.3), and almost double the rate for female residents ages 65 and over (27.3) compared to male residents ages 65 and over (13.8).

Figure 13. Asthma Emergency Department Visits† by Age and Race/Ethnicity, 2021

* Statistically significant difference when compared to reference group
§ The rate for Asian residents ages 45-64 and 65 and over is suppressed due to small numbers (n<11).
† Age-specific rates per 10,000 residents
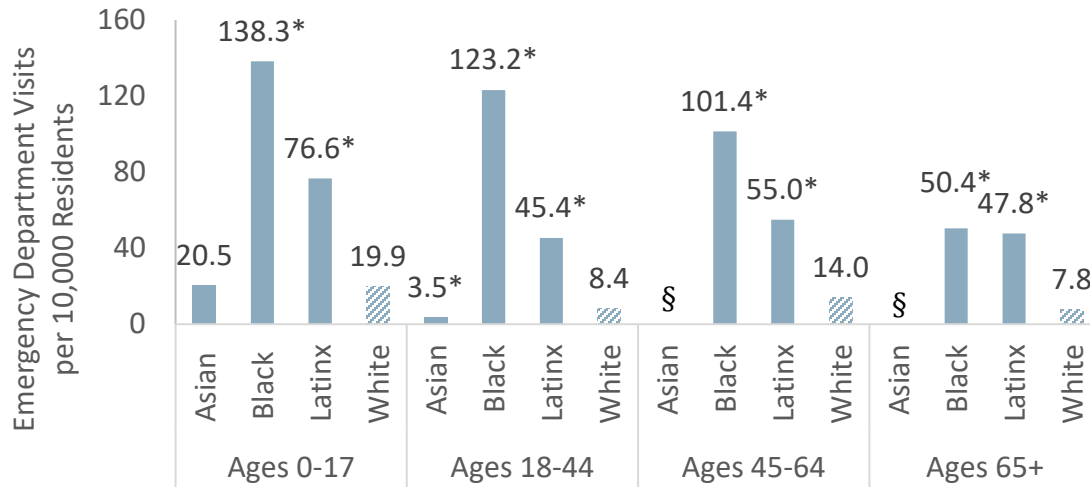NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

In 2021, the rate of asthma emergency department visits per 10,000 Black residents ages 0-17 years (138.3) was 6.9 times the rate for White residents ages 0-17 (19.9). The rate for Latinx residents ages 0-17 (76.6) was 3.8 times the rate for White residents ages 0-17. Among residents ages 18-44, the rate for Asian residents (3.5) was 41.0% lower compared to White residents (8.4). The rate for Black residents (123.2) was 14.6 times the rate for White residents. The rate for Latinx residents(45.4) was 5.4 times the rate of White residents.

Among residents ages 45-64, the rate for Black residents (101.4) was 7.2 times the rate for White residents ages 45-64 (14.0). The rate for Latinx residents (55.0) was 3.9 times the rate for White residents. Among residents ages 65+, the rate for Black residents (50.4) was 6.5 times the rate for White residents (7.8). The rate for Latinx residents (47.8) was 6.1 times the rate for White residents.

Figure 14. Asthma Emergency Department Visits† by Sex and Race/Ethnicity, 2021

* Statistically significant difference when compared to reference group
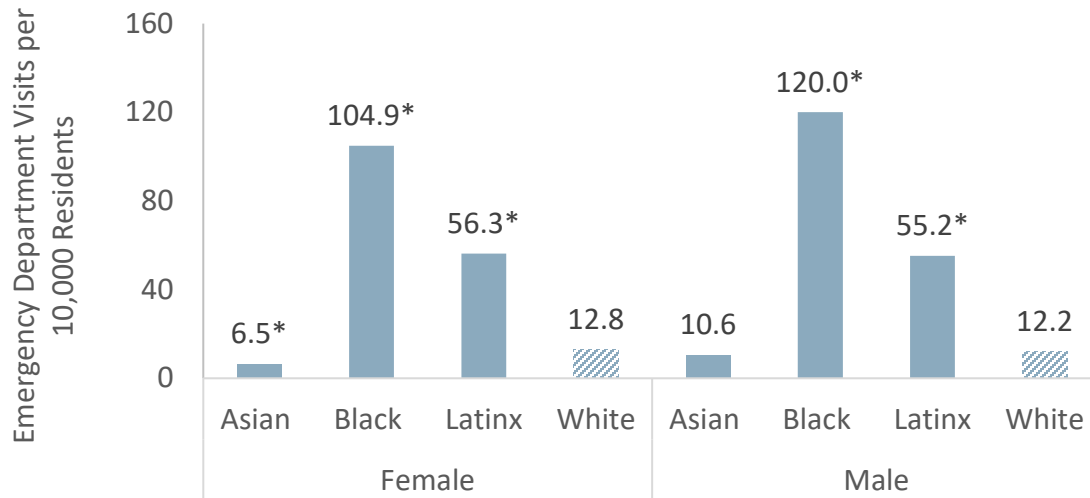† Age-adjusted rates per 10,000 residents
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

In 2021, the age-adjusted asthma emergency department visit rate per 10,000 Black female residents (104.9) was 8.2 times the rate for White female residents (12.8). The rate for Latinx female residents (56.3) was 4.4 times the rate for White female residents. The rate of asthma emergency department visits was 51% lower comparing Asian female residents (6.5) to White female residents. The rate for Black male residents (120.0) was 9.9 times the rate for White male residents (12.2). The rate for Latinx male residents (55.2) was 4.5 times the rate for White male residents.

Figure 15. Asthma Emergency Department Visits† Among Ages 0-17 Years by Race/Ethnicity and Year

	2017	2018	2019	2020	2021
Asian	41.5	48.3	39.9	22.0	20.5
Black	281.4	263.1	243.5	145.7	138.3
Latinx	203.5	168.4	150.5	88.4	76.6
White	60.4	52.9	42.3	28.7	19.9

† Age-specific rates per 10,000 residents
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

From 2017-2021, the age-specific rate of asthma emergency department visits per 10,000 residents ages 0-17 decreased by 55.4% for Asian residents, 53.2% for Black residents, 63.1% for Latinx residents and 65.5% for White residents.

In 2021, the age-specific rate of asthma emergency department visits per 10,000 Black residents ages 0-17 (138.3) was 6.9 times the rate for White residents (19.9). The rate for Latinx residents ages 0-18 (76.6) was 3.8 times higher than White residents.

Figure 16. Asthma Emergency Department Visits† Among Ages 0-17 by Sex and Race/Ethnicity, 2021

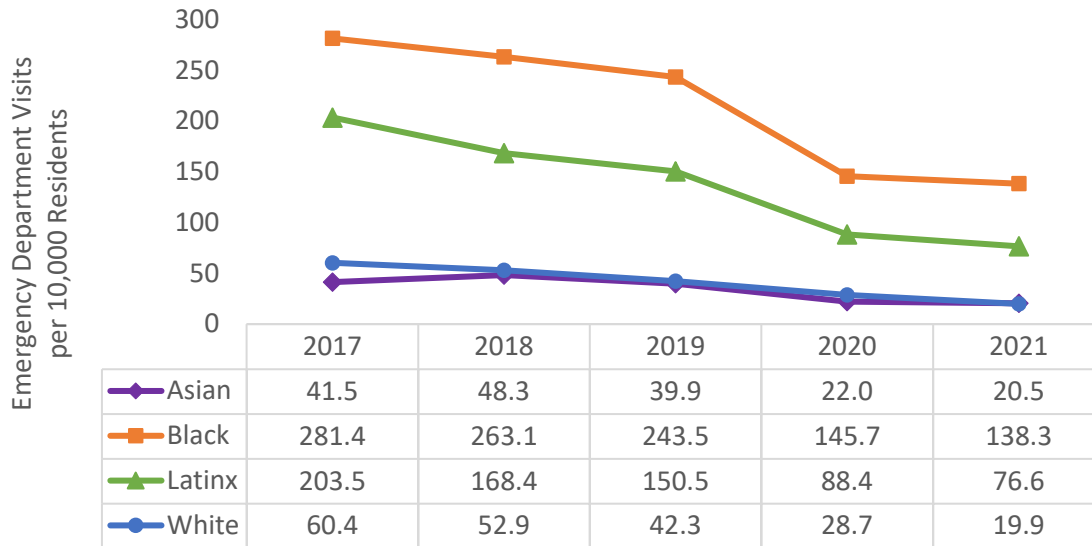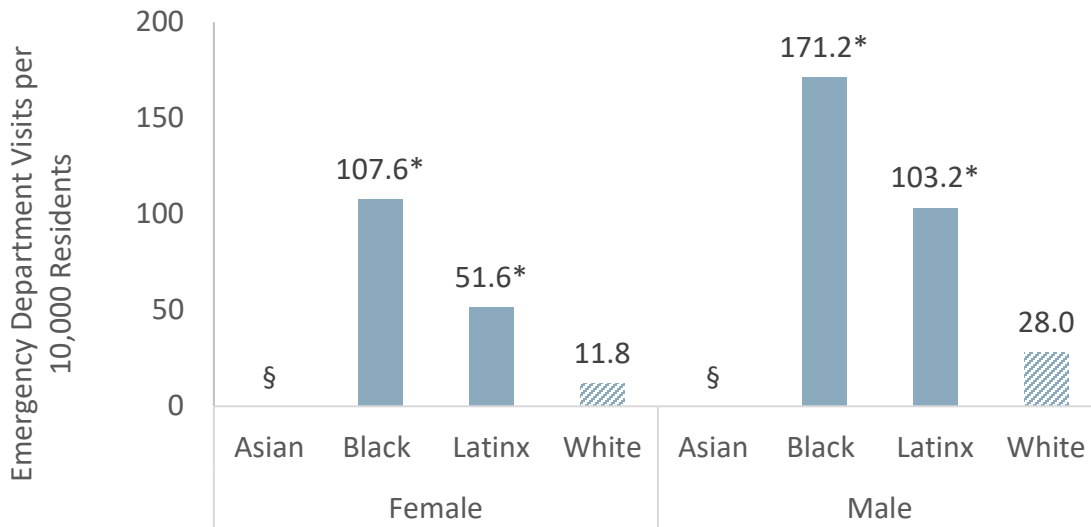* Statistically significant difference when compared to reference group
† Age-specific rates per 10,000 residents
§ Data suppressed for Asian residents due to small numbers (n<11)
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

In 2021, the rate of asthma emergency department visits per 10,000 residents among ages 0-17 was 9.1 times higher for Black female residents (107.6) when compared to White female residents (11.8), and 4.4 times higher for Latinx female residents (51.6) when compared to White female residents.
The rate of asthma emergency department visits among ages 0-17 was 6.1 times higher for Black male residents (171.2) when compared to White male residents (28.0), and 3.7 times higher for Latinx male residents (103.2) when compared to White male residents.

Figure 17. Asthma Emergency Department Visits Among Residents Ages 0-17, by Neighborhood, 2020 and 2021 Combined
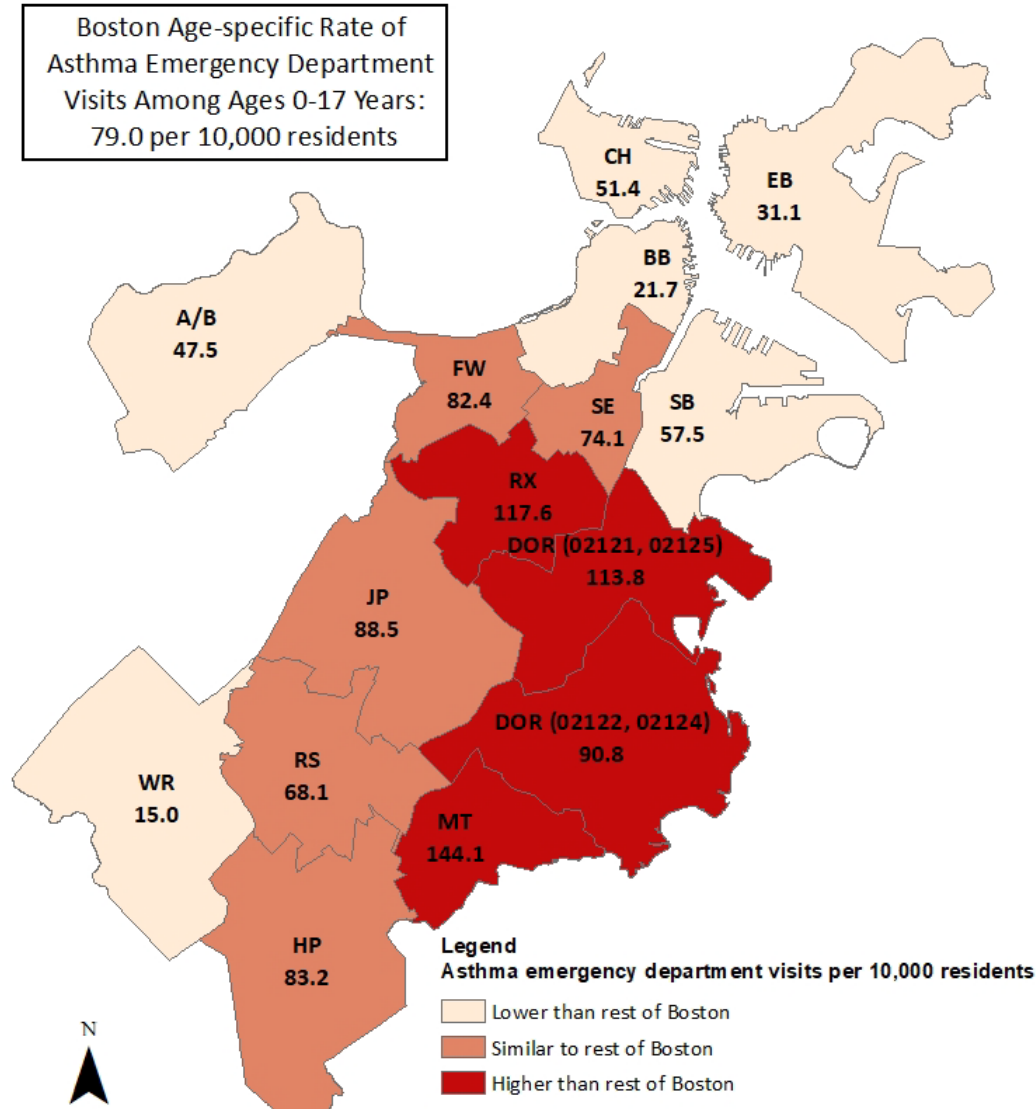
Boston Age-specific Rate of Asthma Emergency Department Visits Among Ages 0-17 Years: 79.0 per 10,000 residents

CH 51.4
EB 31.1
BB 21.7
A/B 47.5
FW 82.4
SE 74.1
SB 57.5
RX 117.6
DOR (02121, 02125) 113.8
JP 88.5
DOR (02122, 02124) 90.8
WR 15.0
RS 68.1
MT 144.1
HP 83.2

Legend
Asthma emergency department visits per 10,000 residents
☐ Lower than rest of Boston
☐ Similar to rest of Boston
☐ Higher than rest of Boston

N

DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis
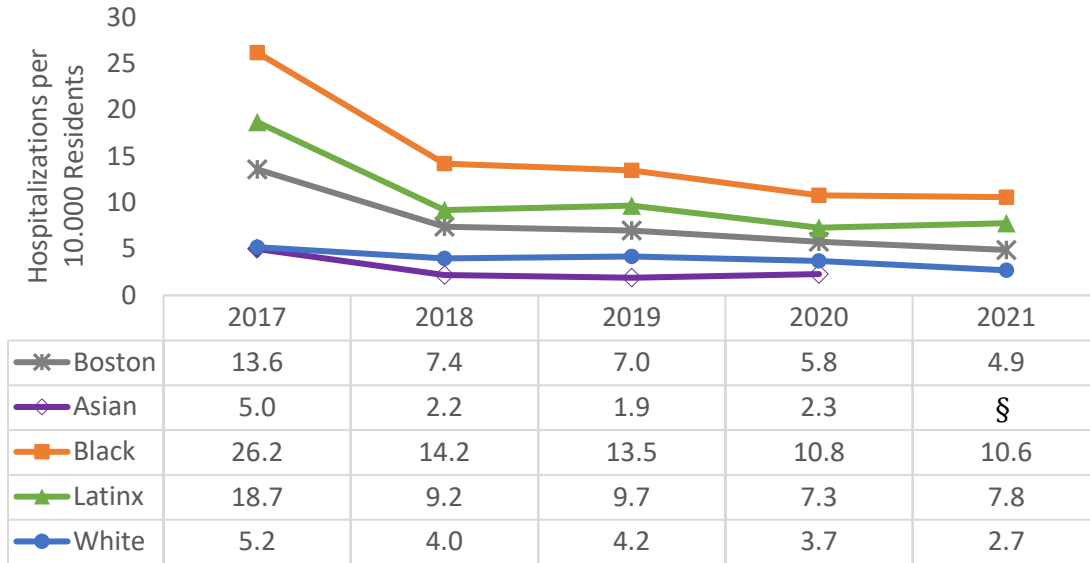
In 2021, the age-specific asthma emergency department visit rate per 10,000 residents was higher than the rest of Boston in Dorchester 02121, 02125, Dorchester 02122, 02124, Mattapan, and Roxbury. The rate was lower than the rest of Boston in Allston/Brighton, Charlestown, Back Bay, East Boston, South Boston, and West Roxbury.

Boston Public Health Commission

Table 2. Asthma Emergency Department Visits Among Residents Ages 0-17, by Neighborhood and Associated ZIP Code, Ranked in Descending Order, 2020 and 2021 Combined

Neighborhood, associated ZIP code(s)	Age Specific Rate per 10,000 Children Ages 0-17
Mattapan (MT), 02126	144.1
Roxbury (RX), 02119, 02120	117.6
Dorchester (DOR), 02121, 02125	113.8
Dorchester (DOR), 02122, 02124	90.8
Jamaica Plain (JP), 02130	88.5
Hyde Park (HP), 02136	83.2
Fenway (FW), 02115, 02215	82.4
South End (SE), 02118, 02111	74.1
Roslindale (RS), 02131	68.1
South Boston (SB), 02127, 02210	57.5
Charlestown (CH), 02129	51.4
Allston/Brighton (AB), 02134, 02135, 02163	47.5
East Boston (EB), 02128	31.1
Back Bay, Downtown, Beacon Hill, North End, West End (BB), 02108-02110, 02113-02114, 02116, 02199	21.7
West Roxbury (WR), 02132	15.0

DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

Figure 18. Asthma Hospitalizations† by Race/Ethnicity, 2017-2021

	2017	2018	2019	2020	2021
Boston	13.6	7.4	7.0	5.8	4.9
Asian	5.0	2.2	1.9	2.3	§
Black	26.2	14.2	13.5	10.8	10.6
Latinx	18.7	9.2	9.7	7.3	7.8
White	5.2	4.0	4.2	3.7	2.7

† Age-adjusted rates per 10,000 residents
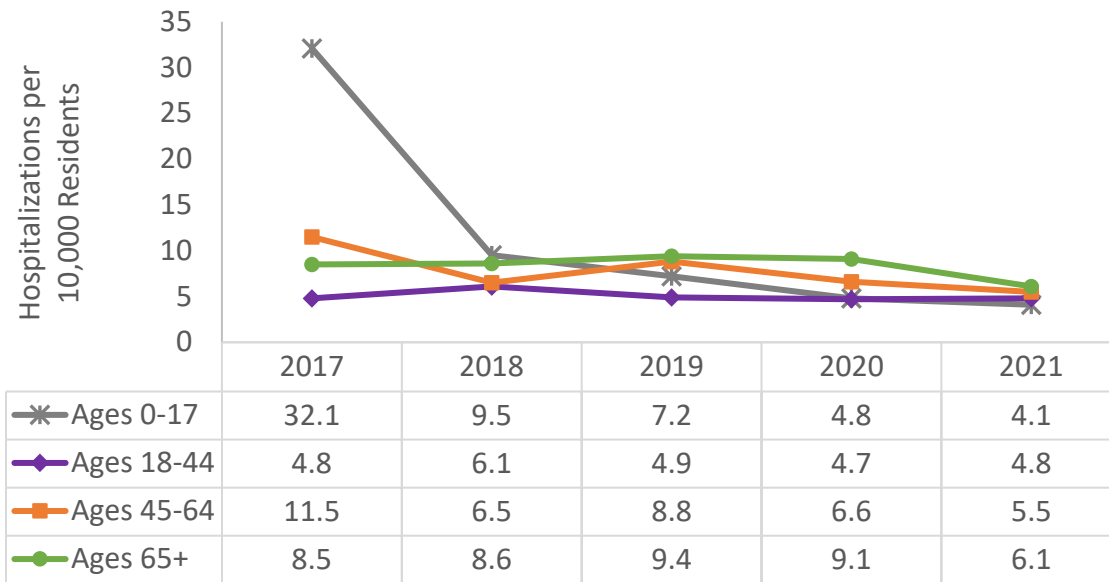§ Data for Asian residents in 2021 is suppressed due to small numbers (n<11).
NOTE: Hollowed out diamonds indicate <20 cases. Data should be interpreted with caution.
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

From 2017-2021, asthma hospitalization rates per 10,000 residents decreased by 63.3% for Boston overall, 61.0% for Black residents, 60.0% for Latinx residents and 42.1% for White residents. While data for Asian residents in 2021 was suppressed due to the small number of hospitalizations (n<11), from 2017-2020, the Asian asthma hospitalization rate decreased by 75%.

In 2021, the asthma hospitalization rate for Boston overall was 4.9 per 10,000 residents. The rate for Black residents (10.6) was 3.9 times the rate for White residents (2.7). The rate for Latinx residents (7.8) was 2.9 times the rate for White residents.

Figure 19. Asthma Hospitalizations† by Age and Year, 2017-2021

|	2017	2018	2019	2020	2021
Ages 0-17	32.1	9.5	7.2	4.8	4.1
Ages 18-44	4.8	6.1	4.9	4.7	4.8
Ages 45-64	11.5	6.5	8.8	6.6	5.5
Ages 65+	8.5	8.6	9.4	9.1	6.1

† Age-specific rates per 10,000 residents
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

Marked by substantial decreases from 2017 to 2018, the asthma hospitalization rate per 10,000 residents decreased by 91% for residents ages 0-17 years and 46.0% for residents ages 45-64 from 2017 to 2021.

Figure 20. Asthma Hospitalizations† by Sex, 2017-2021
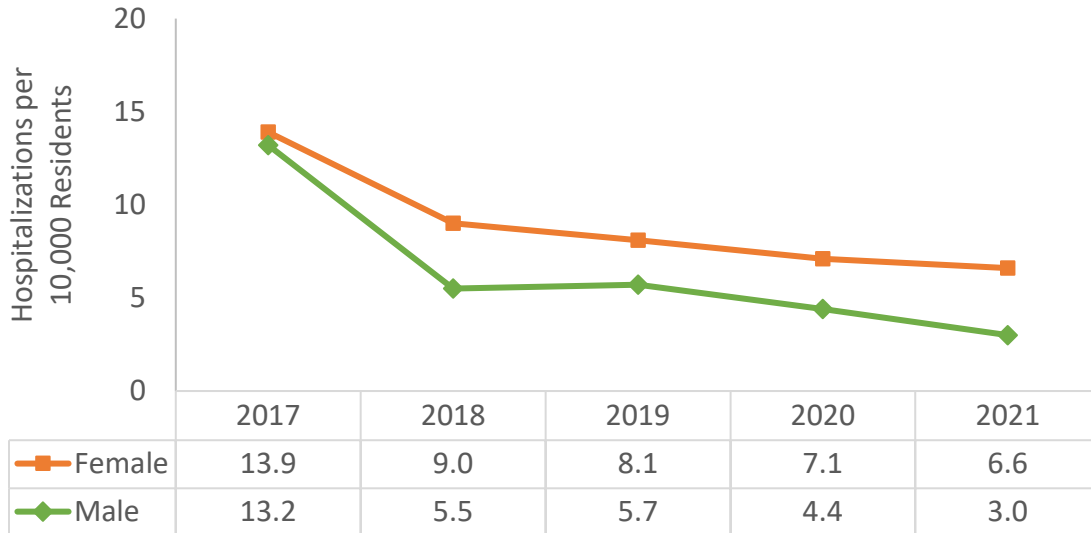
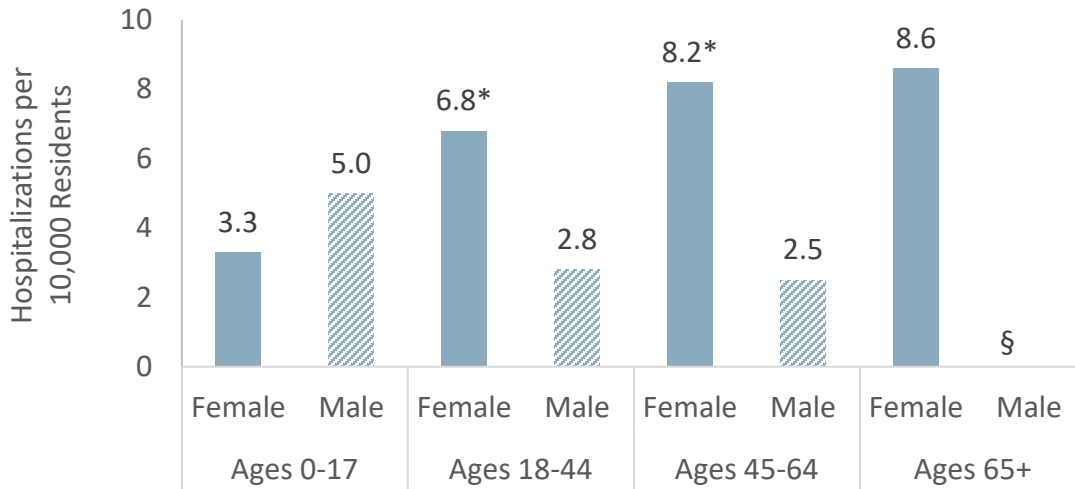|	2017	2018	2019	2020	2021
Female	13.9	9.0	8.1	7.1	6.6
Male	13.2	5.5	5.7	4.4	3.0

† Age-adjusted rates per 10,000 residents
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

From 2017-2021, the age-adjusted asthma hospitalization rate per 10,000 residents decreased by 52.3% for female residents and 76.0% for male residents. In 2021, the rate for female residents (6.6) was 2.2 times the rate for male residents (3.0).

Figure 21. Asthma Hospitalizations† by Age and Sex, 2021
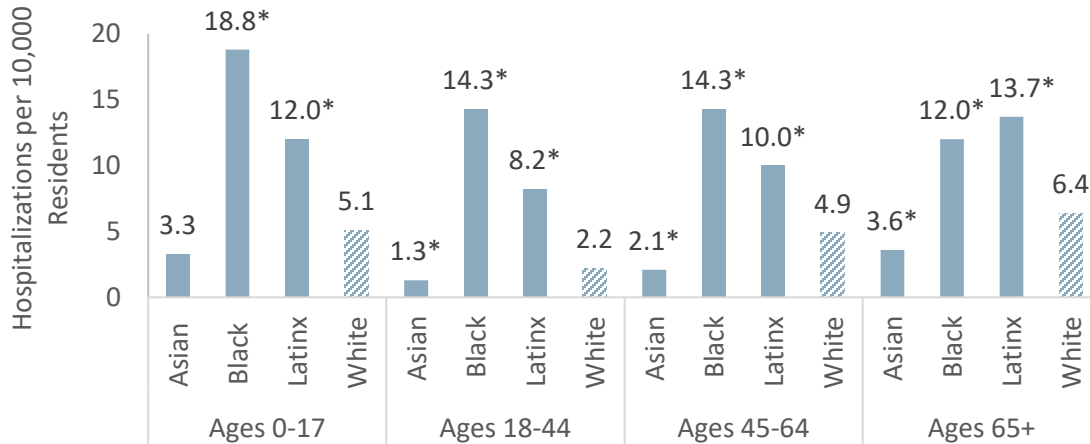

† Age-specific rates per 10,000 residents
§ Data for male residents ages 65 and over is suppressed due to small numbers (n<11).
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

In 2021, asthma hospitalization rate per 10,000 residents for female residents ages 0-44 years (6.8) was 2.5 times the rate for male residents ages 18-44 (2.8). The rate for female residents ages 45-64 (8.2) was 3.2 times the rate for male residents ages 45-64 (2.5).

Figure 22. Asthma Hospitalizations† by Age and Race/Ethnicity, 2017-2021 Combined

* Statistically significant difference when compared to reference group
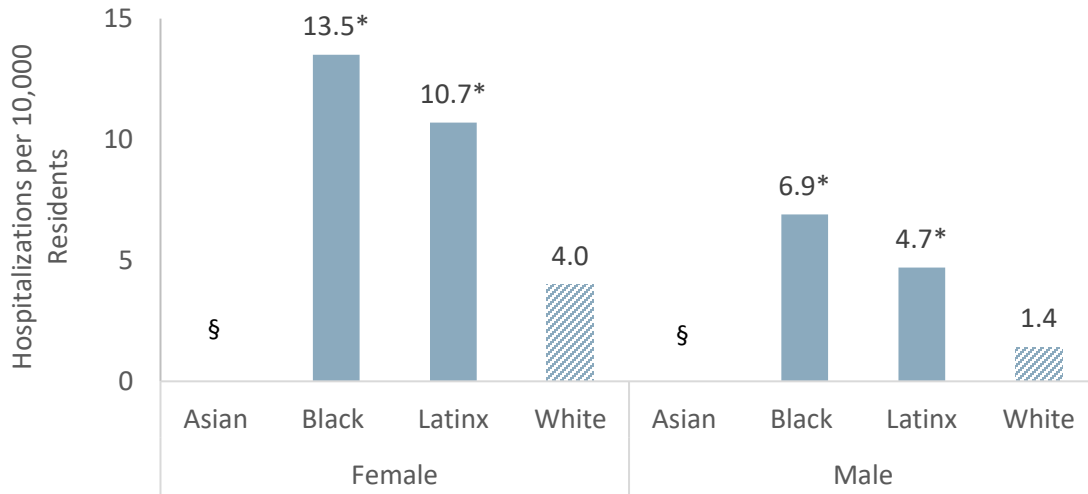† Age-specific rates per 10,000 residents
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Acute care hospital case-mix databases, Massachusetts Center for Health Information and Analysis

For 2017-2021 combined, the age-specific rate of asthma hospitalizations per 10,000 Black residents ages 0-17 (18.8) was 3.7 times the rate for White residents (5.1). The rate for Latinx residents (12.0) was 2.3 times the rate for White residents. Among residents ages 18-44, the rate for Asian residents (1.3) was 58.0% lower than for White residents (2.2). The rate for Black residents (14.3) was 6.5 times the rate for White residents. The rate for Latinx residents (8.2) was 4.7 times the rate for White residents.

Among residents ages 45-64, the rate for Asian residents (2.1) was 43% lower compared to the rate for White residents (4.9). The rate for Black residents (14.3) was 2.9 times the rate for White residents. The rate for Latinx residents (10.0) was twice the rate of White residents. Among residents ages 65 and over, the rate for Asian residents (3.6) was 57% lower compared to White residents (6.4). The rate for Black residents (12.0) was 1.9 times the rate for White residents. The rate for Latinx residents (13.7) was 2.2 times the rate for White residents.

Figure 23. Asthma Hospitalizations† by Sex and Race/Ethnicity, 2021

† Age-adjusted rates per 10,000 residents
* Statistically significant difference when compared to reference group
§ Data for Asian residents is suppressed due to small numbers (n<11).
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

For 2021, the age-adjusted asthma hospitalization rate per 10,000 for Black female residents (13.5) was 3.4 times the rate for White female residents (4.0). The rate for Latinx female residents (10.7) was 2.7 times the rate for White female residents. The rate for Black male residents (6.9) was 5.1 times the rate for White male residents (1.4). The rate for Latinx male residents (4.7) was 3.4 times the rate for White male residents.

SUMMARY

Asian, Black, and Latinx Boston public high school students experienced higher prevalence of asthma compared to their White counterparts. The prevalence of Boston public high school students with asthma was lower for foreign-born students who have lived in the United States for less than 6 years when compared with students who were born in the United States.

Black adults experienced higher prevalence of asthma compared with their White counterparts. Prevalence differences were also observed across other demographic and social determinant population groups. Specifically, higher rates of asthma were observed among adults with lower household income and who lived in publicly supported housing. LGBTQ residents had higher percentages of asthma compared with heterosexual and cisgender residents.

From 2017-2021, the age-specific asthma emergency department visit rate per 10,000 residents decreased for all age groups. Additionally, both asthma emergency department visits and hospitalizations decreased across all racial/ethnic groups from 2017-2021. While this progress is encouraging, Black and Latinx residents consistently had much higher rates of asthma emergency department visits and hospitalizations compared to White residents. These inequities remained when stratifying further by sex and by age. Younger age groups had higher rates of asthma emergency department visits and hospitalizations, with the highest rates being among residents ages 0-17 years old. Among residents ages 0-17, asthma emergency department visits were highest in the Dorchester, Mattapan, and Roxbury neighborhoods.

GLOSSARY OF STATISTICAL TERMS

Age-Adjusted Rate (AAR): Age-adjustment is a statistical process applied to rates of disease and death which allows populations or groups with different age structures to be compared. The occurrence of disease and death is often associated with age and the age distribution between populations may differ considerably. Thus, AARs are helpful when comparing rates over time and between groups or populations. An AAR is derived by: 1) calculating the age-specific rates (ASRs) across all age groups 2) multiplying by age-specific weights that come from proportion of the 2000 US standard population within each age group 3) summing the adjusted age-specific rates. In this report, AARs are used for the presentation of asthma hospital and emergency department visits. All AARs are based on a standard population distribution that covers all ages.

Confidence Interval: A range of values based on a chosen probability level within which the true value of a population parameter is likely found. With a 95% confidence interval, one can assume the true value has a high probability of being contained within the interval (i.e., falling between the two values that define the endpoints of the interval).

Prevalence: The proportion of persons in a population who have a particular disease or attribute at a specified point in time or over a specified period of time. Prevalence differs from incidence in that prevalence includes all cases, both new and preexisting, in the population at the specified time, whereas incidence is limited to new cases only.

Rates: A rate is a measure of a type of event, disease, or condition occurring among a population per unit(s) of time, for instance, the number of asthma hospitalizations per 10,000 population for a given year or across multiple years. Two types of rates are presented in this report: crude rates and age-adjusted rates (AARs). The population denominators used for calculating rates is derived through interpolation or extrapolation using data from the 2020 and 2010 U.S Census. Linear interpolation/extrapolation involves the calculation of an average annual percent change for use in estimating population denominators. Linear interpolation is preferred to using a single year of US Census data when calculating rates for intercensal years.

Statistical Significance: An attribute of data based on statistical testing. A statistical test examines differences between rates or percentages to help determine if that observed difference reflects a true difference in the actual population experience, as opposed to one observed simply due to chance. Statistical significance means that an observed difference is most likely true; it does not mean that the difference is necessarily clinically meaningful or important.

DATA SOURCES

Boston Youth Risk Behavior Survey, Youth Risk Behavior Surveillance System (YRBSS), Centers for Disease Control and Prevention and Boston Public Schools: The Youth Risk Behavior Surveillance System (YRBSS) is a system of national school-based surveys conducted by the Centers for Disease Control and Prevention (CDC) every other year among public high school students in grades 9-12. It is currently conducted in 47 states, 6 territories, 2 tribal governments, and 22 cities. The survey contains questions related to risk behaviors such as unintentional injuries and violence, alcohol and drug use, tobacco use, sexual behavior, unhealthy eating behaviors, physical inactivity, and the prevalence of obesity and asthma. The Boston Public Health Commission uses results from the YRBSS to identify the prevalence of health risk behaviors among Boston youth, identify racial/ethnic inequities, plan and implement health initiatives, support health-related legislative activities, and assist in obtaining grants and other funding.

Boston Behavioral Risk Factor Surveillance System, (BBRFSS), Population Health and Research Office, Boston Public Health Commission: The Boston Behavioral Risk Factor Surveillance System (Boston BRFSS) is a system of telephone health surveys of adults living in non-institutional household settings ages 18 and over that collects information on health risk behaviors, preventive health practices, and health care access primarily related to chronic disease and injury. The Boston Public Health Commission (BPHC) conducts an independent survey approximately every other year modeled after the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS) survey. Over time, the survey has been modified by BPHC to be more reflective of health determinants specific to the Boston population. However, the Boston Behavioral Risk Factor Surveillance System survey has maintained many standard core questions included in the BRFSS used by the Massachusetts Department of Public Health. Results from the survey are used by BPHC to plan and implement health initiatives; to identify health problems within populations; to identify racial/ethnic inequities in access to and utilization of health care, in risk behaviors, and selected health conditions; to establish and monitor health objectives; to support health-related legislative activities; to evaluate disease prevention activities and programs; and to assist in receiving grants and other funding. This report uses Boston BRFSS data from the following years: 2015, 2017, 2019, 2021.

Health of Boston Survey of People Experiencing Homelessness, Boston Public Health Commission: The Health of Boston Survey of People Experiencing Homelessness (HOB-SPEH) is a first of its kind comprehensive health survey of unhoused adults (i.e., adults experiencing homelessness as individuals, not as families) conducted in partnership between the Boston

Boston Public Health Commission

Public Health Commission (BPHC) and Boston University School of Public Health. The survey content was heavily based on Boston Behavioral Risk Factor Surveillance System (BBRFSS) survey items, covering a wide range of health topics and social determinants of health, and supplemented with additional items more directly related to homelessness, drug use and housing preferences. The survey was administered from June through August of 2022 among 300 adults utilizing services at BPHC's two emergency shelters (a low-threshold overnight shelter for those experiencing homelessness regardless of substance use) and the Engagement Center (a low-threshold daytime space for individuals navigating homelessness and substance use) located in the Mass and Cass area of Boston. While on a given night the demographic profile of homelessness in Boston is not entirely known, the HOB-SPEH was designed to ensure survey results reflect this non-family homeless population across all shelters in Boston. As a consequence, survey results describe racial, ethnic and gender-specific differences among unhoused population which subsequently informs the provision of client services and related policy. For more information, please contact the BPHC Population Health and Research Office.

Acute Hospital Case Mix Databases (Hospital Inpatient Discharge Database and Outpatient Emergency Department Database), Massachusetts Center for Health Information and Analysis: These emergency department visit and hospitalization data present information on Boston resident care received at acute care hospitals in Massachusetts. All rates are based on encounter count totals covering fiscal years running October through September (e.g., year 2021 covers HPEs from October 2020-September 2021). For a given hospitalization, the patient's primary diagnosis is used for determination of asthma.

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