HEALTH OF BOSTON 2023

THE DIABETES REPORT

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ACKNOWLEDGEMENTS

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FOREWORD

Welcome to the Boston Public Health Commission's (BPHC) Health of Boston 2023: The Diabetes Report. This is one of a series of reports providing disease-specific 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 diabetes experience of Boston residents.

The report highlights trends in diabetes prevalence, hospitalizations, and mortality. Data sources include the United States (US) census, death registries, hospital inpatient discharge databases, and surveys that describe individual health conditions and behaviors of both housed and unhoused Boston residents.

Individual characteristics and behaviors play an important role in health outcomes, and positive changes in individual behavior related to diet and exercise can reduce the risk of developing diabetes. It is important, however, to acknowledge that individual behaviors are inextricably linked and often limited by the social and economic context of an individual's life. In addition to these social and economic determinants, lifelong exposure to varying forms of racism and discrimination may cause prolonged stress, which can also adversely impact health outcomes. Compounding these inequities, diabetes is a risk factor for more severe cases of COVID-19, resulting in higher rates of COVID-19 hospitalization and mortality among Black and Latinx residents.

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). In addition, a potential association between diabetes and COVID-19 mortality is presented. 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.

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INTRODUCTION

This report highlights trends in diabetes prevalence, hospitalizations, and mortality. Data sources include the US Census, death registry, hospital inpatient discharge databases, an adult health survey that provides data for individual health conditions and behaviors, and a survey that examines health conditions and behaviors of individuals experiencing homelessness in Boston. This is the first of a series of reports providing surveillance data on the health of Boston. The report aims to provide residents, medical and public health professionals, health policy makers, and community advocates with actionable information on the diabetes experience of Boston residents.

What is diabetes?

Diabetes is a disease in which the body cannot effectively regulate its blood glucose (sugar) levels because it is unable to produce or use a hormone called insulin. Normally, insulin moves glucose from blood into cells where this sugar is used as energy. In people with diabetes, there is excess glucose in the bloodstream, which affects multiple organs, including the heart, kidneys, eyes, skin, and peripheral nerves. There are three main categories of diabetes: type 1, type 2, and gestational diabetes. Type 2 diabetes accounts for 90-95% of cases and occurs when the body becomes less sensitive to the insulin the pancreas produces, usually because of obesity. Type 1 diabetes occurs when the pancreas itself stops making enough insulin to regulate blood glucose levels (1). Gestational diabetes occurs later in pregnancy and increases risk of complications for both the mother and developing fetus if not properly controlled.

Symptoms of diabetes include frequent urination, excessive thirst, weight loss, fatigue, and increased susceptibility to infection. Poorly controlled diabetes may lead to debilitating complications including blindness, kidney damage, stroke, peripheral vascular disease, and heart disease, including heart attack (1). Approximately 11% of US adults reported ever having diabetes in 2020, and the rate of new diabetes cases among US adults 18 years and older was 5.9 per 10,000 in 2019 (2,3).

Populations at risk for diabetes:

People who are overweight or obese are at the highest risk of developing type 2 diabetes. Among US adults, Black and Latinx adults are more likely to be diagnosed with type 2 diabetes compared with White adults. Having a close family member with diabetes is a risk factor for

developing type 2 diabetes (4). Socioeconomic disadvantages at the individual and neighborhood level are also associated with a higher risk of developing type 2 diabetes (5, 6).

Prevention of diabetes:

Lifestyle changes can prevent or delay the onset of diabetes and help control diabetes once diagnosed. Eating a healthy diet, maintaining a healthy weight, exercising regularly, and avoiding smoking can help prevent diabetes (4, 7).

Racism and diabetes:

Nationally, the risk of receiving a diabetes diagnosis is higher for Black and Latinx adults compared with White adults (8). The effects of structural and institutional racism can lead to increased rates of diabetes. Historical discriminatory housing policies present as neighborhoods with inadequate affordable housing, open spaces, health food access, and increased exposure to environmental pollutants. These social determinants of health contribute to decreased opportunities for physical activity and access to healthy food, both of which can prevent diabetes (9). Studies show that redlining (discriminatory practices that systematically deny services such as mortgages, insurance loans, and other financial services to residents in certain areas based on race/ethnicity, outlawed in 1968) continued to have statistically significant impacts on mortality and loss of years of life in major cities within the US across the years of 1990-2014 (10).

COVID-19 and diabetes:

People with diabetes are more likely to have severe symptoms and complications from COVID-19. Nationally, 39.7% of patients hospitalized with COVID-19 also had diabetes. This percentage increased to 46.5% for patients ages 50-64 (11). Diabetes contributes to COVID-19 health inequities, as American Indian, Black, and Latinx populations have higher rates of diabetes, putting them at higher risk for severe complications and hospitalization from COVID-19. Studies suggest that COVID-19 might be associated with diabetes incidence, although further research is needed to understand this association (12).

METHODS

This report presents diabetes-related data among Boston residents from 2015 to 2021 derived mainly from four data sources: (1) Boston adult diabetes prevalence data are from the Boston Behavioral Risk Factor Surveillance System (Boston BRFSS), Boston Public Health Commission (BPHC); (2) Boston adults experiencing homelessness diabetes prevalence data are from the Health of Boston Survey of People Experiencing Homelessness, Boston Public Health

Commission (BPHC); (3) Boston resident diabetes hospitalizations are from the acute hospital case-mix databases, Massachusetts Center for Health Information and Analysis (CHIA); and (4) Boston resident diabetes mortality data are from the Massachusetts Resident Death files, Massachusetts Department of Public Health.

Adult diabetes 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 proportions (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 to compare two demographic groups within a given time period ($p<.05$).

Hospitalization and mortality rates within this report are age-adjusted to permit comparisons that mitigate 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.

For Boston hospitalization and mortality comparisons, rate changes 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 hospitalization and mortality rates increased or decreased was determined by assessing linear change across the entire 5-year time period using Poisson regression ($p<.05$).

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. When two rates were compared and the difference was not found to be statistically significant, the two rates are described as “similar” if mentioned in text. Demographic group differences for diabetes 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 2020 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 as the US Census Bureau releases further detailed 2020 population data.

All racial and ethnic designations except those from the death certificate, 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 US to describe themselves, and they permit us to identify and address health inequities that exist across racial and ethnic groups.

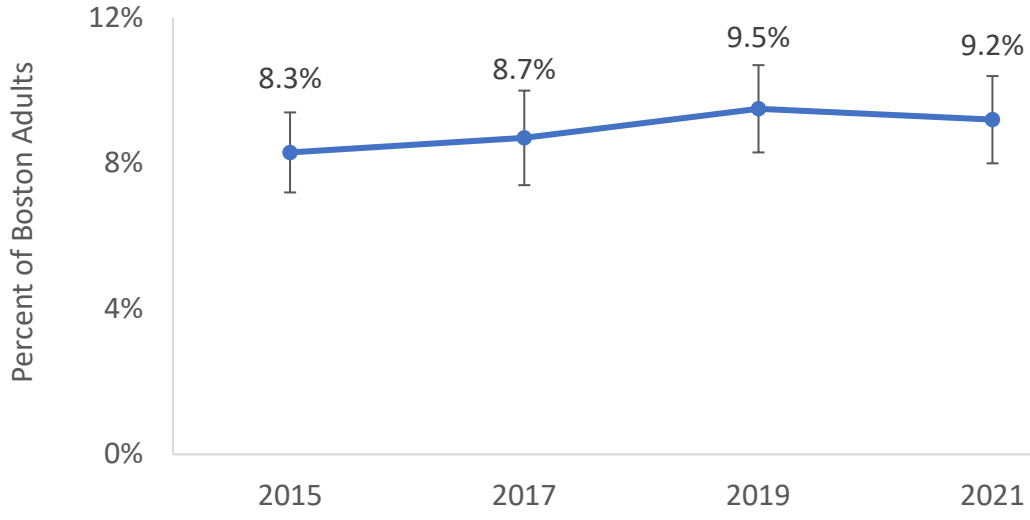
In order to identify these inequities racial/ethnic group comparisons involved using White residents as the reference group and assessing the difference between each non-White resident group rate (e.g., rate for Black residents) and the White resident (reference group) rate. For sex-based comparisons, 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-Hispanic racial groups. Boston-specific data by race and ethnicity is presented for non-Hispanic Asian residents, non-Hispanic Black residents, non-Hispanic White residents, and Latinx residents of any race. Few sources have data in large enough counts to allow presentation of data on smaller groups i.e., the many ethnicities included under the category "Asian." Additionally, small survey sample size and case numbers limit the 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.

SECTION 1. DIABETES PREVALENCE

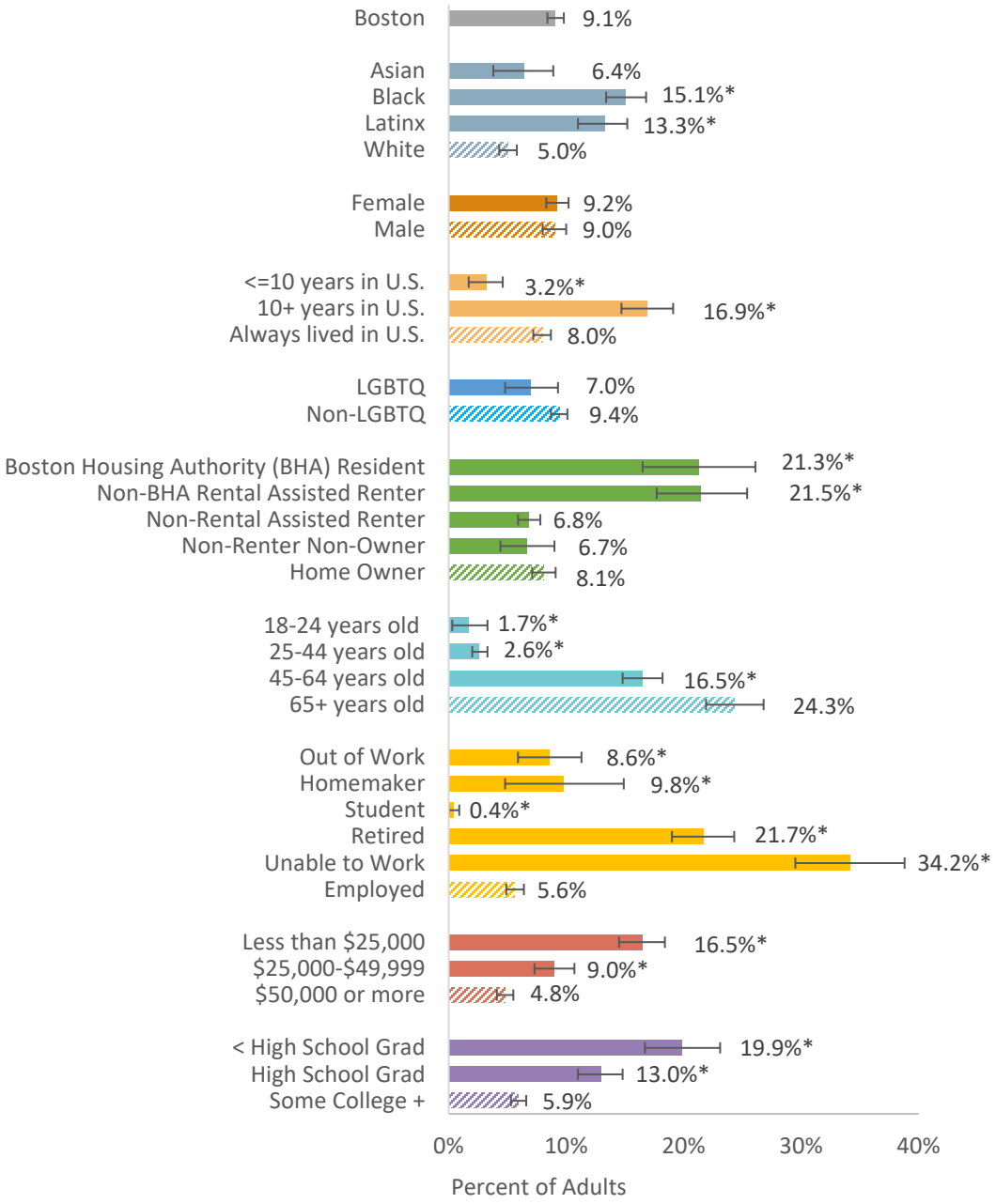
Figure 1. Diabetes Among Adults by Year, 2015-2021



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

In 2021, 9.2% of Boston adult residents reported having diabetes. By comparison, 10.9% of adults in the United States and 8.9% of adults in Massachusetts reported having diabetes in 2021 (13). There was no significant change from 2015-2021.

Figure 2. Diabetes Among Adults by Selected Demographics, 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

During the combined years of 2017, 2019, and 2021, 9.1% of Boston adult residents reported having diabetes.

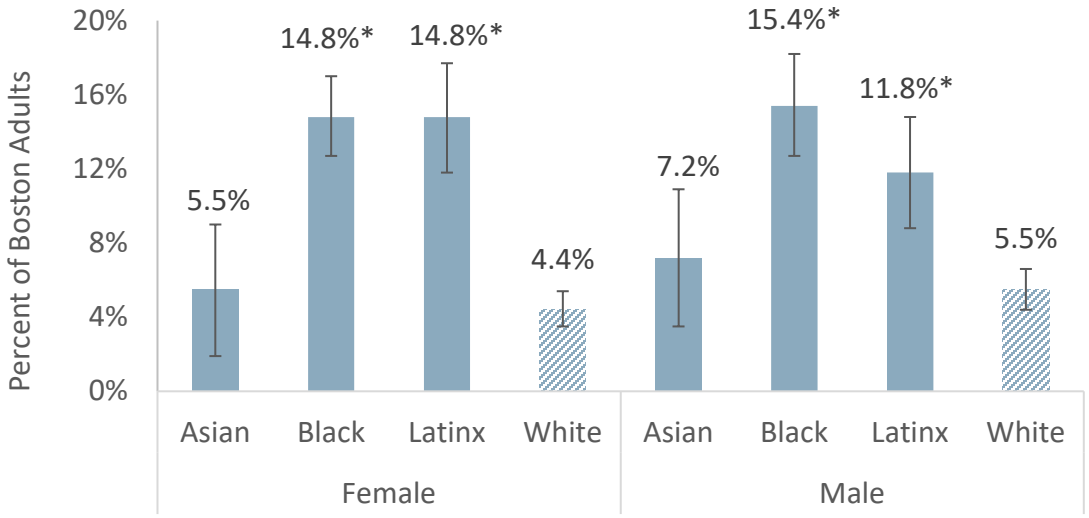
The percentage of residents with diabetes was higher for the following groups:

- Black (15.1%) and Latinx (13.3%) adults compared with White adults (5.0%)
- Adults who were out of work (8.6%), homemakers (9.8%), unable to work (34.2%), and retired (21.7%) compared with adults who were employed (5.6%)
- Adults living in households with an annual income of less than $25,000 (16.5%) or $25,000-$49,999 (9.0%) compared with adults living in households with an annual income of $50,000 or more (4.8%)
- Adults who were Boston Housing Authority residents (21.3%) and renters who received rental assistance (21.5%) compared with adults who owned a home (8.1%)
- Foreign-born adults who lived in the United States for over 10 years (16.9%) compared with those who were born in the United States (8.0%)
- Adults with less than a high school diploma (19.9%) and adults with a high school diploma (13.0%) compared with adults with at least some college education (5.9%)

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

- Foreign-born adults who lived in the United States for 10 years or fewer (3.2%) compared with those who were born in the United States (8.0%)
- Adults ages 45-64 (16.5%), 25-44 (2.6%), 18-24 (1.7%) compared with adults ages 65+ years old (24.3%)
- Adults who were students (0.4%) compared to employed adults (5.5%)

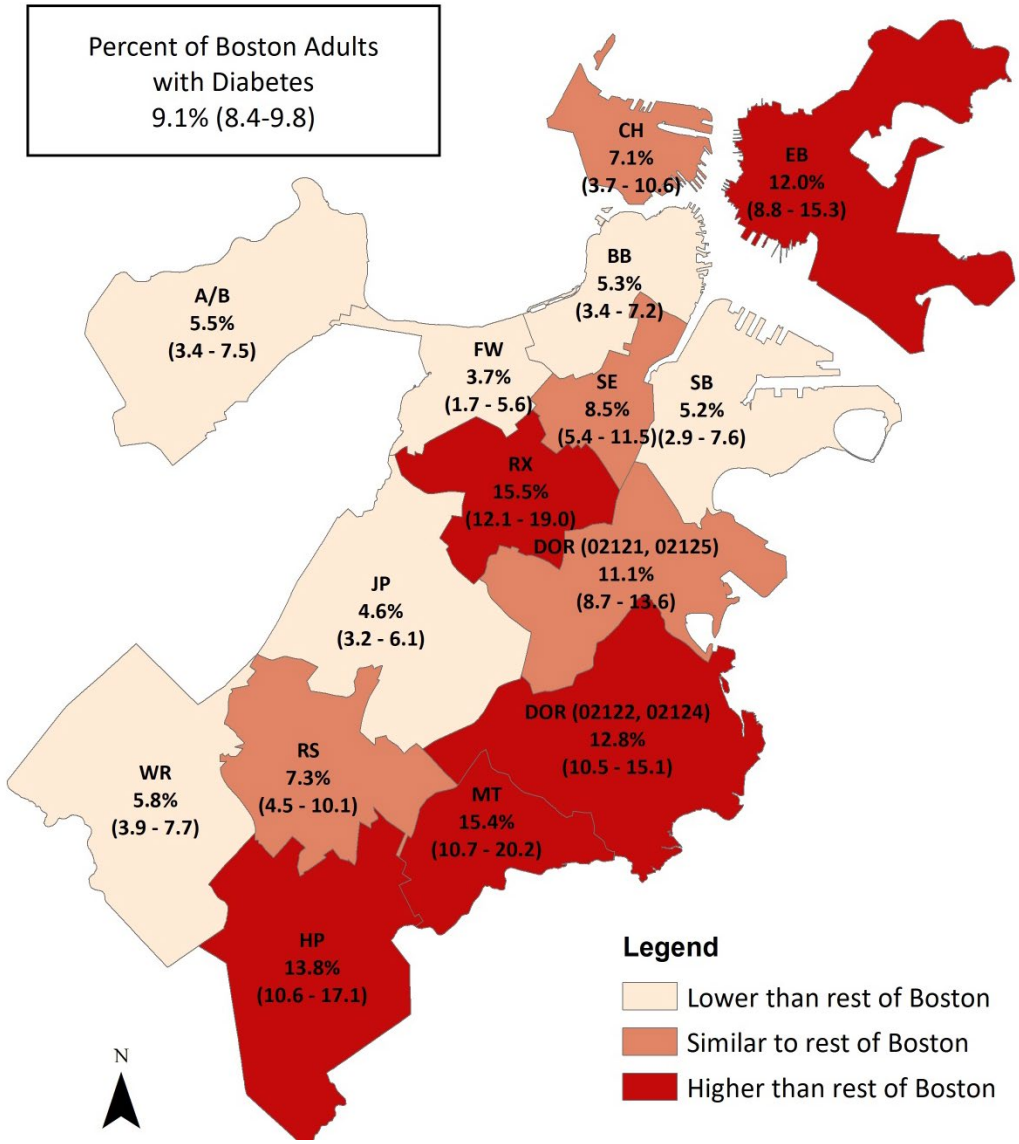
Figure 3. Diabetes Among Adults by Race/Ethnicity and Sex, 2017, 2019, 2021 Combined



* 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 a higher percentage of Black (14.8%) and Latinx (14.8%) female adults had diabetes compared with White females (4.4%). Similarly, a higher percentage of Black male adults (15.4%) and Latinx male adults (11.8%) had diabetes compared with White male adults (5.5%).

Figure 4. Diabetes Among Adults by Neighborhood, 2017-2021 Combined



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

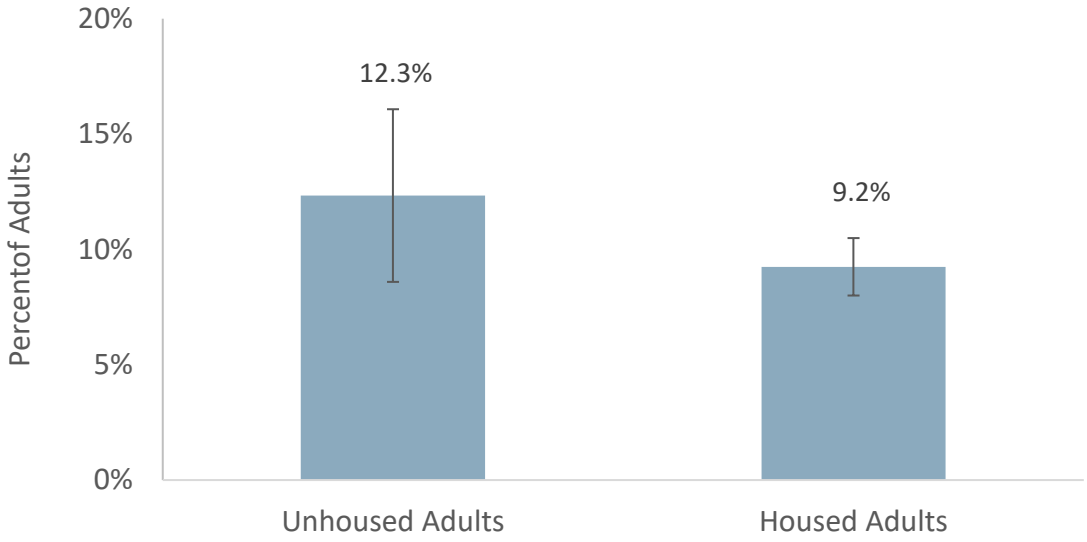
During 2017, 2019, and 2021 combined, the percentage of Boston adult residents with diabetes was lower in Fenway, Jamaica Plain, Back Bay, Allston/Brighton, South Boston, and West Roxbury compared with the rest of Boston. The percentage of adults with diabetes was higher in Dorchester (02122, 02124), Hyde Park, Roxbury, Mattapan, and East Boston compared with the rest of Boston.

Table 1. Diabetes by Neighborhood, Ranked in Descending Order, 2017, 2019, 2021 Combined

Neighborhood, associated ZIP code(s)	Estimate	95% Confidence Intervals
Roxbury (RX), 02119, 02120	15.5	(12.1 - 19)
Mattapan (MT), 02126	15.4	(10.7 - 20.2)
Hyde Park (HP), 02136	13.8	(10.6 - 17.1)
Dorchester (DOR), 02121, 02125	12.8	(10.5 - 15.1)
East Boston (EB), 02128	12.0	(8.8 - 15.3)
Dorchester (DOR) 02122, 02124	11.1	(8.7 - 13.6)
South End (SE), 02111, 02118	8.5	(5.4 - 11.5)
Roslindale (RS), 02131	7.3	(4.5 - 10.1)
Charlestown (CH), 02129	7.1	(3.7 - 10.6)
West Roxbury (WR), 02132	5.8	(3.9 - 7.7)
Allston/Brighton (AB), 02134, 02135, 02163	5.5	(3.4 - 7.5)
Back Bay, Downtown, Beacon Hill, North End, West End (BB), 02108-02110, 02113-02114, 02116, 02199	5.3	(3.4 - 7.3)
South Boston (SB), 02127, 02210	5.2	(2.9 - 7.6)
Jamaica Plain (JP), 02130	4.6	(3.2 - 6.1)
Fenway (FW), 02115, 02215	3.7	(1.7 - 5.6)

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

Figure 5. Diabetes Among Housed and Unhoused (i.e., Homeless) Adults, 2021



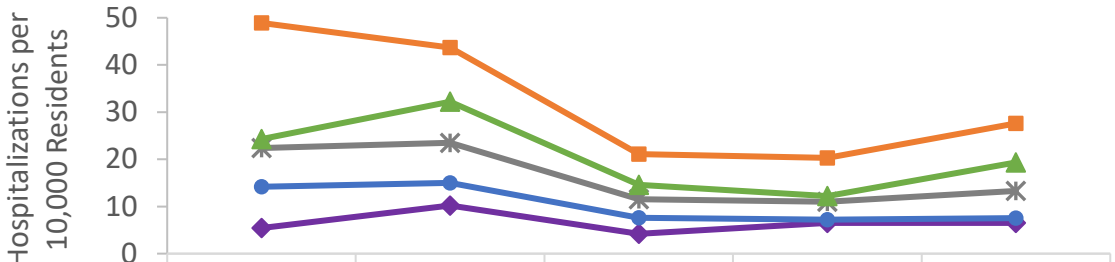
DATA SOURCES: Boston Behavioral Risk Factor Surveillance System, BPHC (2021); Health of Boston Survey of People Experiencing Homelessness, BPHC (2021)

In 2021, 12.3% of unhoused (i.e., homeless) adults had diabetes compared to 9.2% 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 2. DIABETES HOSPITALIZATIONS

Figure 6. Diabetes Hospitalizations† by Race/Ethnicity and Year, 2017-2021

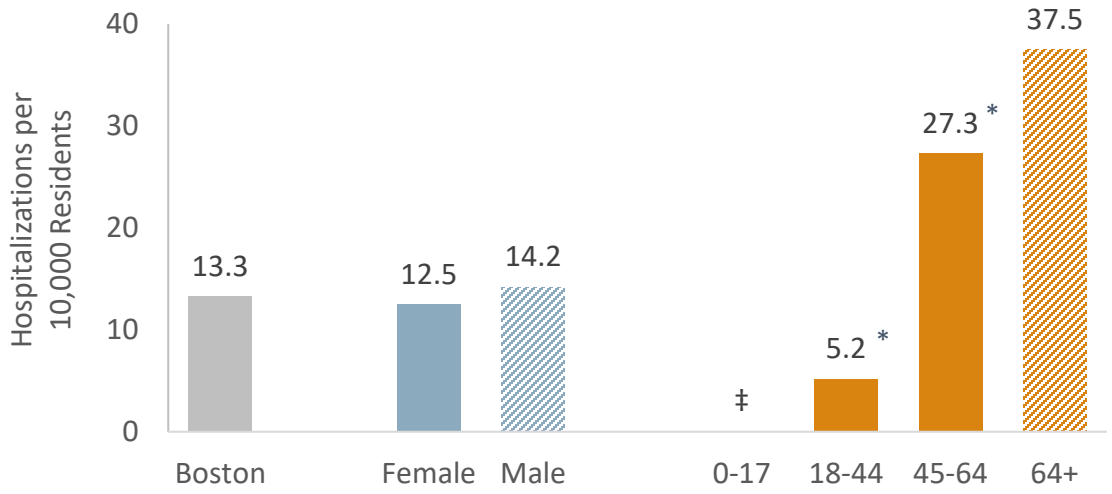


	2017	2018	2019	2020	2021
Boston	22.4	23.5	11.5	11	13.3
Asian	5.4	10.2	4.2	6.5	6.5
Black	48.9	43.7	21.1	20.3	27.6
Latinx	24.3	32.2	14.6	12.2	19.3
White	14.2	15	7.6	7.2	7.5

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

From 2017 to 2021, the age-adjusted diabetes hospitalization rate decreased by 53.2% for Boston overall, 56.7% for White residents, 44.2% for Latinx residents, and 56.5% for Black residents. In 2021, the diabetes hospitalization rate for Boston residents was 13.3 per 10,000 residents. In 2021, the rate for Black residents (27.6) was 3.7 times the rate for White residents (7.5). The rate for Latinx residents (19.3) was 2.6 times the rate for White residents.

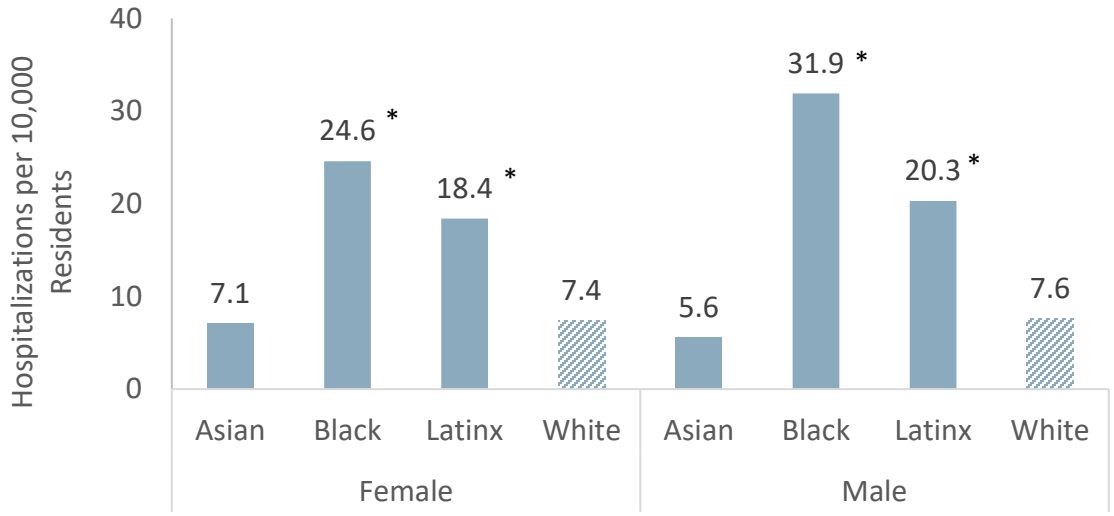
Figure 7. Diabetes Hospitalizations† by Selected Demographics, 2021



* Statistically significant difference when compared to reference group
† Age-adjusted rates per 10,000 residents
‡ Data suppressed due to too few hospitalizations (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 age-adjusted diabetes hospitalization rate was 13.3 per 10,000 residents. Compared to Boston residents ages 65 and over (37.5), the diabetes hospitalization rate was 86.1% lower among residents ages 18–44 years (5.2) and 27% lower among residents 45–64 years (27.3).

Figure 8. Diabetes Hospitalizations by Sex and Race/Ethnicity, 2021

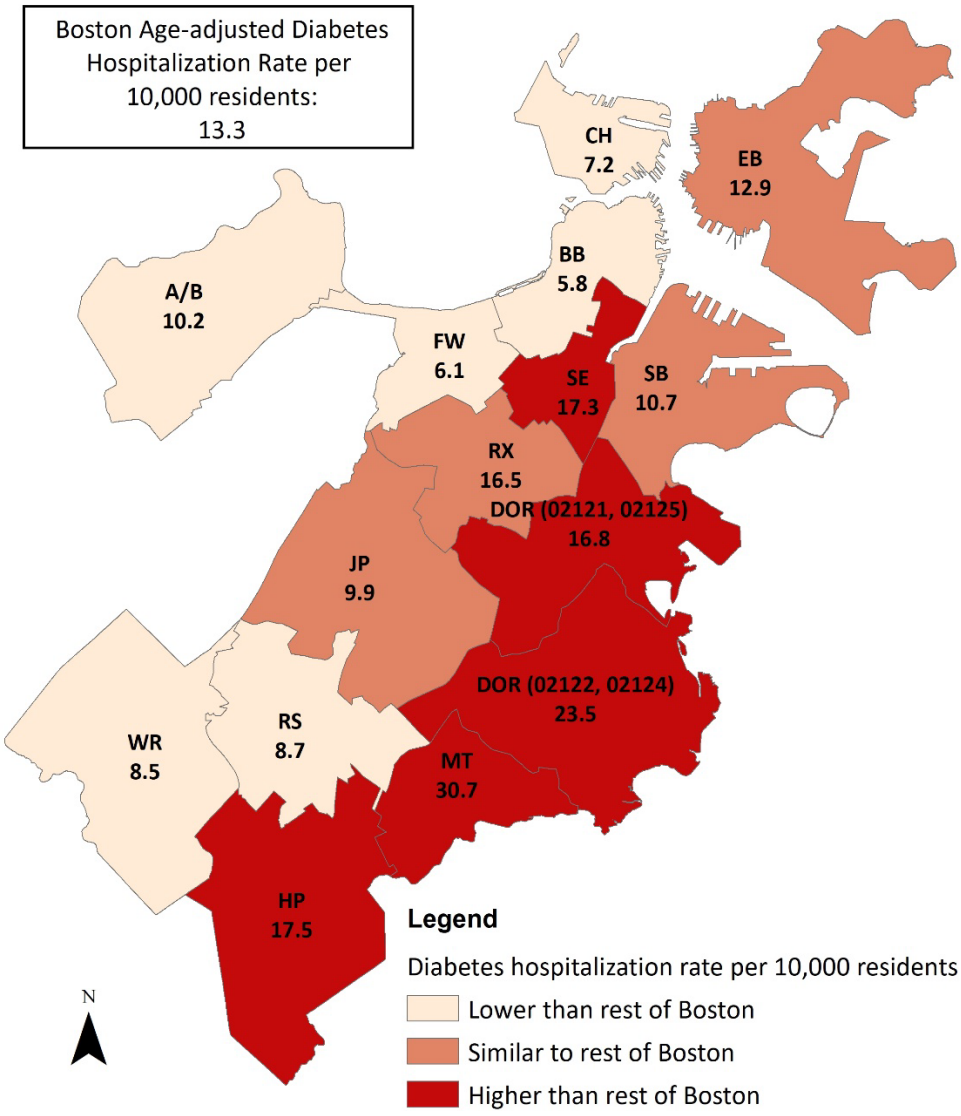


* Statistically significant difference when compared to reference group
† Age-adjusted rates per 10,000 residents
NOTE: Bars with hatch marks indicate the reference group within each selected indicator.
DATA SOURCE: Acute Hospital Case Mix Database, Massachusetts Center for Health Information and Analysis

In 2021, the age-adjusted diabetes hospitalization rate per 10,000 residents for Black female residents (24.6) was 3.3 times the rate for White female residents (7.4). The rate for Latinx female residents (18.4) was 2.5 times the rate for White female residents.

The diabetes hospitalization rate for Black male residents (31.9) was 4.2 times the rate for White male residents (7.6). The rate for Latinx male residents (20.3) was 2.7 times the rate for White male residents.

Figure 9. Age-Adjusted Diabetes Hospitalization Rate by Neighborhood, 2021



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

In 2021, the age-adjusted diabetes hospitalization rate per 10,000 residents was higher than the rest of Boston in Dorchester 02121, 02125, Dorchester 02122, 02124, Mattapan, Hyde Park, and the South End. The rate was lower than the rest of Boston in Allston/Brighton, Charlestown, Back Bay, Fenway, Roslindale, and West Roxbury.

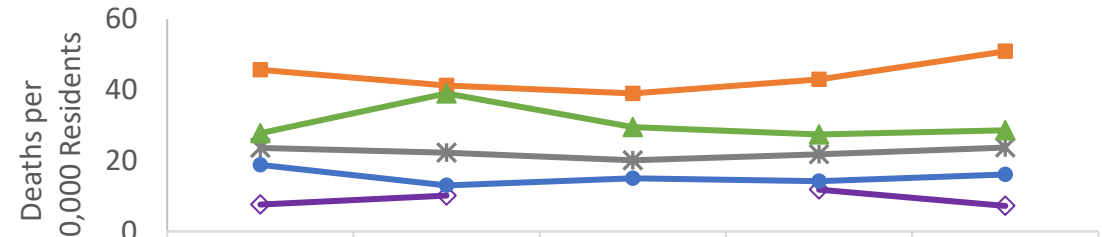
Table 2. Age-Adjusted Diabetes Hospitalization Rates by Neighborhood, Ranked in Descending Order, 2021

Neighborhood, associated ZIP code(s)	Age-Adjusted Hospitalization Rate
Mattapan (MT), 02126	30.7
Dorchester (DOR), 02122, 02124	23.5
Hyde Park (HP), 02136	17.5
South End (SE), 02111, 02118	17.3
Dorchester (DOR), 02121, 02125	16.8
Roxbury (RX), 02119, 02120	16.5
East Boston (EB), 02128	12.9
South Boston (SB), 02127, 02210	10.7
Allston/Brighton (AB), 02134, 02135, 02163	10.2
Jamaica Plain (JP), 02130	9.9
Roslindale (RS), 02131	8.7
West Roxbury (WR), 02132	8.5
Charlestown (CH), 02129	7.2
Fenway (FW), 02115, 02215	6.1
Back Bay, Downtown, Beacon Hill, North End, West End (BB), 02108-02110, 02113-02114, 02116, 02199	5.8

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

SECTION 3. BOSTON DIABETES MORTALITY

Figure 10. Diabetes Mortality† by Race/Ethnicity and Year, 2017-2021



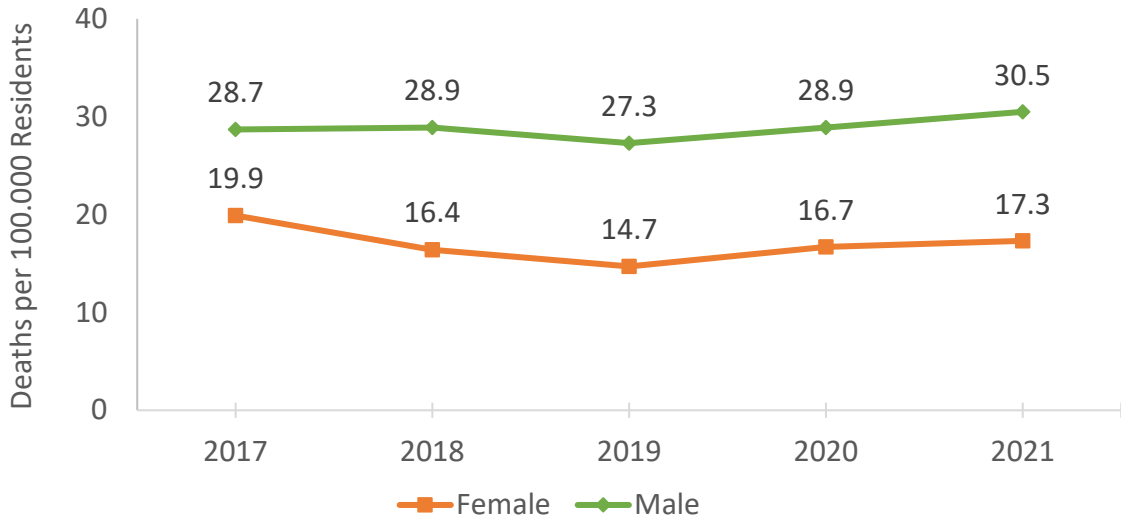
	2017	2018	2019	2020	2021
Boston	23.6	22.2	20.1	21.8	23.7
Asian	7.6	10.1	‡	11.8	7.2
Black	45.7	41.2	39	43	50.9
Latinx	27.8	39	29.5	27.4	28.6
White	18.8	13	15	14.2	16.1

†Age-adjusted rates per 100,000 residents
NOTE: Hollowed-out symbols represent rates based on 20 or fewer cases and should be interpreted with caution.
‡Rates for Asian residents in 2019 are not presented due to a small number of cases (n<5) for 2019.
DATA SOURCE: Boston resident deaths, Massachusetts Department of Public Health
Please be advised that 2020-2021 data are preliminary and subject to change. Raw preliminary data may be incomplete or inaccurate, have not been fully verified, and revisions are likely to occur following the production of these data. The Department of Public Health strongly cautions users regarding the accuracy of statistical analyses based on preliminary data and particularly with regard to small numbers of events.
Data may be updated as more information becomes available.

In 2021, there were 23.6 deaths per 100,000 Boston residents due to diabetes. Between 2017 and 2021, there was no significant changes in diabetes mortality rates for Asian, Black, Latinx, or White residents.

In 2021, the diabetes mortality rate for Black residents (50.9) was over three times the rate for White residents (16.1). The rate for Latinx residents (28.6) was 78% higher than the rate for White residents.

Figure 11. Diabetes Mortality† by Sex and Year, 2017-2021

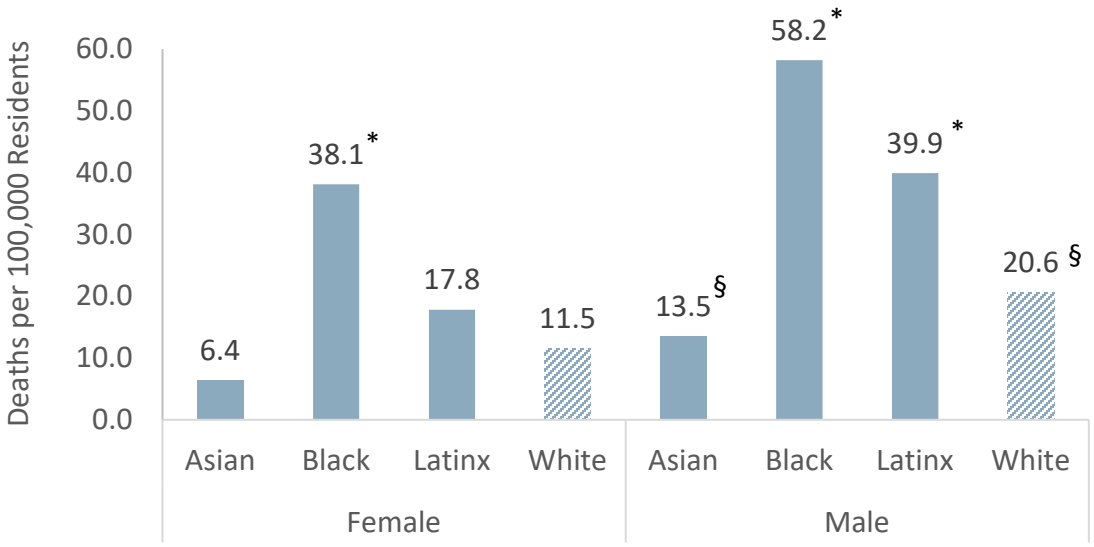


† Age-adjusted rates per 100,000 residents
DATA SOURCE: Boston resident deaths, Massachusetts Department of Public Health
Please be advised that 2020-2021 data are preliminary and subject to change. Raw preliminary data may be incomplete or inaccurate, have not been fully verified, and revisions are likely to occur following the production of these data. The Department of Public Health strongly cautions users regarding the accuracy of statistical analyses based on preliminary data and particularly with regard to small numbers of events.

Between 2017 and 2021, there was no significant change in the age-adjusted diabetes mortality rate per 100,000 residents for either male or female residents.

In 2021, the rate for female residents (17.3) was 43.4% lower than the rate for male residents (30.5).

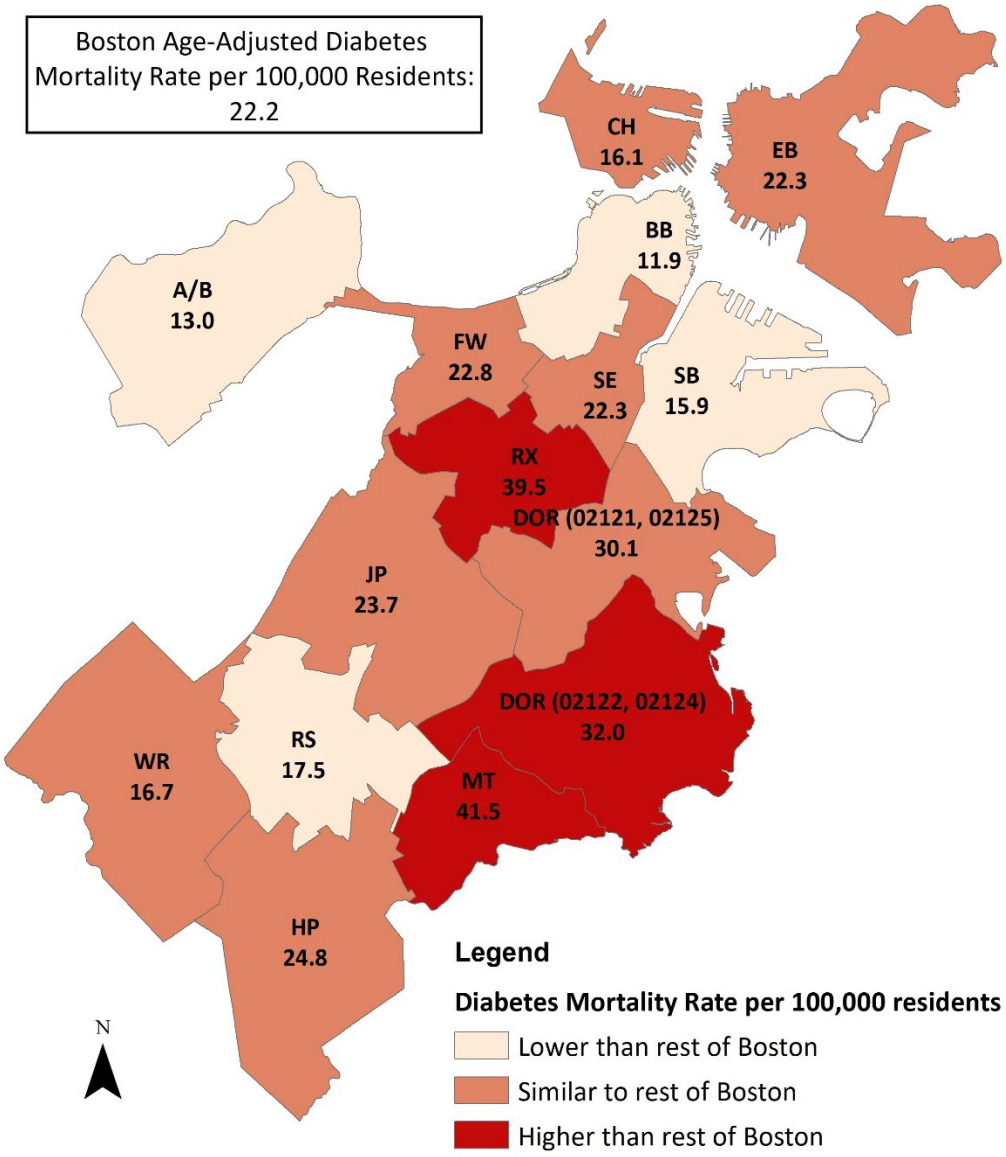
Figure 12. Diabetes Mortality† by Sex and Race/Ethnicity, 2020-2021



* Statistically significant difference when compared to reference group
† Age-adjusted rates per 100,000 residents
§ Rates are based on 20 or fewer cases and should be interpreted with caution.
NOTE: Bars with hatch marks indicate the reference group within each selected indicator
DATA SOURCE: Boston resident deaths, Massachusetts Department of Public Health
Please be advised that 2020-2021 data are preliminary and subject to change. Raw preliminary data may be incomplete or inaccurate, have not been fully verified, and revisions are likely to occur following the production of these data. The Department of Public Health strongly cautions users regarding the accuracy of statistical analyses based on preliminary data and particularly with regard to small numbers of events.

For 2020-2021 combined, the age-adjusted diabetes mortality rate per 100,000 residents for Black female residents (38.1) was 3.3 times the rate for White female residents (11.5). The diabetes mortality rate for Black male residents (58.2) and Latinx male residents (39.9) was 2.8 and 1.9 times, respectively, the rate for White male residents (20.6).

Figure 13. Age-Adjusted Diabetes Mortality Rate by Neighborhood, 2017-2021 Combined



DATA SOURCE: Boston resident deaths, Massachusetts Department of Public Health

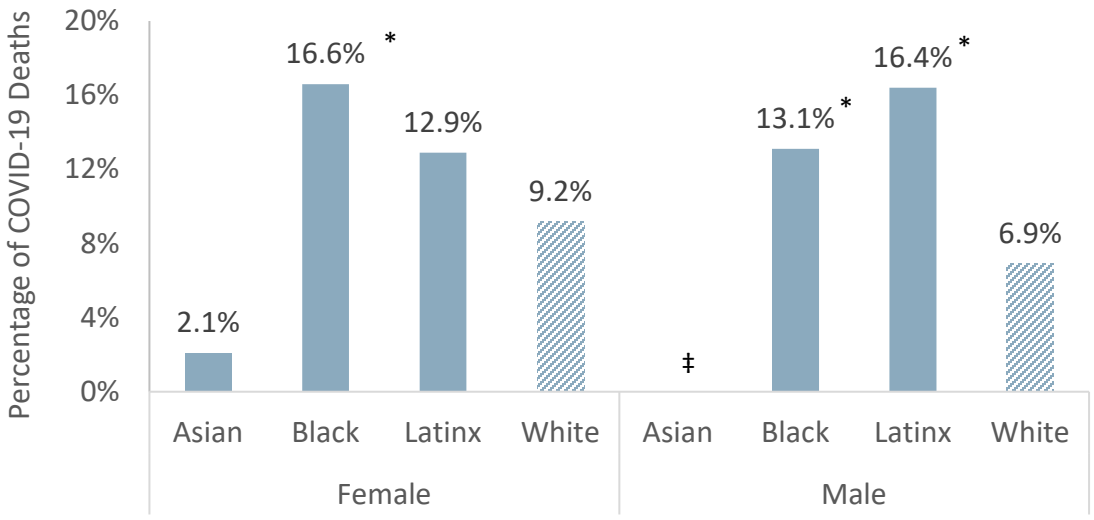
For 2017-2021, the age-adjusted diabetes mortality rate per 100,000 residents was lower for Allston/Brighton, Back Bay, Roslindale, and South Boston compared with the rest of Boston. The rates for Dorchester 02122, 02124, Mattapan, and Roxbury were higher compared with the rest of Boston.

Table 3. Age-Adjusted Diabetes Mortality Rates by Neighborhood, Ranked in Descending Order, 2017-2021 Combined

Neighborhood, associated ZIP code(s)	Age-Adjusted Mortality Rate
Mattapan (MT), 02126	41.5
Roxbury (RX), 02119, 02120	39.5
Dorchester (DOR), 02122, 02124	32.0
Dorchester (DOR), 02121, 02125	30.1
Hyde Park (HP), 02136	24.8
Jamaica Plain (JP), 02130	23.7
Fenway (FW), 02115, 02215	22.8
East Boston (EB), 02128	22.3
South End (SE), 02111, 02118	22.3
Roslindale (RS), 02131	17.5
West Roxbury (WR), 02132	16.7
Charlestown (CH), 02129	16.1
South Boston (SB), 02127, 02210	15.9
Allston/Brighton (AB), 02134, 02135, 02163	13.0
Back Bay, Downtown, Beacon Hill, North End, West End (BB), 02108-02110, 02113-02114, 02116, 02199	11.9

DATA SOURCE: Boston resident deaths, Massachusetts Department of Public Health
Please be advised that 2020-2021 data are preliminary and subject to change. Raw preliminary data may be incomplete or inaccurate, have not been fully verified, and revisions are likely to occur following the production of these data. The Department of Public Health strongly cautions users regarding the accuracy of statistical analyses based on preliminary data and particularly with regard to small numbers of events.

Figure 14. Percentage of COVID-19 Deaths with Diabetes as a Contributing Cause, 2020-2021



* Statistically significant difference when compared to reference group
‡ Data suppressed due to too few deaths (n<5)
NOTE: Bars with hatch marks indicate the reference group within each selected indicator
DATA SOURCE: Boston resident deaths, Massachusetts Department of Public Health
Please be advised that 2020-2021 data are preliminary and subject to change. Raw preliminary data may be incomplete or inaccurate, have not been fully verified, and revisions are likely to occur following the production of these data. The Department of Public Health strongly cautions users regarding the accuracy of statistical analyses based on preliminary data and particularly with regard to small numbers of events.

For 2020-2021 combined, there were 1,152 deaths among Boston residents with COVID-19 as the underlying cause. Among these, 11.5% identified diabetes as a contributing cause of death.

The proportion of COVID-19 deaths with diabetes listed as a contributing cause varied by race/ethnicity and gender. Among females, 2.1% of Asian, 16.6% of Black, 12.9% of Latinx, and 9.2% of White COVID-19 deaths had diabetes as a contributing cause. Among males, 13.1% of Black, 16.4% of Latinx, and 6.9% of White COVID-19 deaths had diabetes as a contributing cause.

SUMMARY

Overall, Black and Latinx residents experienced higher levels of diabetes and diabetes-related health outcomes while Asian residents experienced similar levels compared with White residents.

Specifically, Black and Latinx adults experienced higher prevalence of diabetes compared with their White counterparts. Prevalence differences were also observed across other demographic and social determinant population groups. Diabetes disproportionately affected adults with less education, who were not employed, with lower household income, and who lived in publicly supported housing. In Boston, elevated percentages of adult diabetes were largely concentrated among neighborhoods with relatively higher levels of these disproportionately impacted demographic groups, including Dorchester 02121, 02125, Dorchester 02122, 02124, East Boston, Hyde Park, Mattapan, and Roxbury.

Although similar racial/ethnic inequities were observed for diabetes hospitalizations, rates decreased from 2017-2021 for most racial ethnic groups. Of note, these decreases might be reflecting lower utilization of the hospital care system for non-COVID related diagnoses during the earlier phases of the COVID-19 pandemic (2020 and 2021).

Black and Latinx residents also experienced higher diabetes mortality rates than White residents consistently from 2017-2021. While there were no significant changes in diabetes *as a leading cause* of mortality over time, diabetes additionally contributed to 11.5% of COVID-19 mortality overall in 2020 and 2021. Black and Latinx residents experienced higher percentages of diabetes contributing to COVID-19 mortality compared with White residents.

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 a 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 diabetes hospitalizations and mortality. 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 deaths due to diabetes per 100,000 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). In this report, death rates are based on the primary cause only. The population denominators used for calculating rates is derived through interpolation or extrapolation using data from the 2020 and 2010 US 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 Behavioral Risk Factor Surveillance System, (Boston BRFSS), 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 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

Boston's 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 at populationhealth@bphc.org.

Acute Hospital Case-Mix Databases (Hospital Inpatient Discharge Database and Outpatient Emergency Department Database), Massachusetts Center for Health Information and Analysis: These hospitalization data present information on Boston resident hospitalizations to acute care hospitals in Massachusetts. All rates are based on hospital patient encounter (HPE) 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 diabetes.

Boston Resident Deaths, Registry of Vital Records and Statistics, Office of Data Management and Outcomes Assessment, Massachusetts Department of Public Health: Death data used by the Boston Public Health Commission pertains only to Boston residents. This report used death data from 2017 to 2021. Death records are completed with the assistance of an informant, typically a family member or funeral director, which may result in errors (for example, in race/ethnicity reporting) that would not occur in self-reported data. Please be advised that 2020-2021 data are preliminary and subject to change. Raw preliminary data may be incomplete or inaccurate, have not been fully verified, and revisions are likely to occur following the production of these data. The Department of Public Health strongly cautions users regarding the accuracy of statistical analyses based on preliminary data and particularly with regard to small numbers of events.

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