



## Massachusetts HIV/AIDS Epidemiologic Profile Statewide Report – Data as of 2/1/2021

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# LIST OF COMMONLY USED ACRONYMS

<b>AFAB</b>	Assigned Female at Birth
<b>AI/AN</b>	American Indian/Alaska Native
<b>AIDS</b>	Acquired Immunodeficiency Syndrome
<b>AMAB</b>	Assigned Male at Birth
<b>API</b>	Asian/Pacific Islander
<b>BIDLS</b>	Bureau of Infectious Disease and Laboratory Sciences
<b>HIV</b>	Human Immunodeficiency Virus
<b>HSR</b>	Health Service Region
<b>HTSX</b>	Heterosexual Sex
<b>IDU</b>	Injection Drug Use
<b>MDPH</b>	Massachusetts Department of Public Health
<b>MSM</b>	Male-to-Male Sex, Men Who Have Sex with Men
<b>N</b>	Number
<b>N/A</b>	Not Applicable
<b>NH</b>	Non-Hispanic
<b>NIR</b>	No Identified Risk
<b>PLWH</b>	Persons (or Individuals) Living with HIV Infection
<b>Pres. HTSX</b>	Presumed Heterosexual Sex
<b>PR/USD</b>	Puerto Rico/United States Dependency
<b>PWID</b>	Persons Who Inject Drugs

## Epidemic at a Glance

- The number of persons living with HIV infection (PLWH) in Massachusetts increased by 19% from 19,543 in 2010 to 23,291 in 2019.
- After remaining relatively stable at approximately 700 diagnoses per year from 2010 to 2013 (four-year average = 701), then approximately 640 diagnoses per year from 2014 to 2018 (five-year average = 641), the number of new HIV infection diagnoses declined to a ten-year low of 538 in 2019. The number of new HIV infection diagnoses decreased by 13% from 615 in 2015 to 538 in 2019.
- The number of deaths due to any cause among individuals reported with HIV/AIDS remained relatively stable from 2010 to 2019, with an average of 291 deaths per year (with a low of 266 in 2011 and a high of 320 in 2015).
- Although there have been reductions in new cases and increased survival of PLWH, vulnerable populations remain disproportionately impacted:
  - Men who have sex with men (MSM) continued to represent the largest proportion of new HIV infection diagnoses (40% overall and 54% among individuals assigned male at birth (AMAB) in 2017–2019, as of 2/1/2021).
  - Individuals with IDU exposure mode accounted for 35% of deaths among individuals with HIV/AIDS in 2019 but only 16% of all PLWH (as of 12/31/2019).

## Trends in HIV Infection Diagnoses Over Time

- The number of individuals diagnosed with HIV infection has decreased over the past decade in Massachusetts, but disparities persist by exposure mode, race/ethnicity, place of birth, and age.
- Male-to-male sex (MSM) remained the predominant exposure mode from 2010 to 2019.
- After declining by 53% from 2010 (N=66) to 2014 (N=31), the number of reported cases with injection drug use (IDU) as the primary exposure mode peaked at 116 in 2017 and then decreased to 60 in 2019. The increase was primarily due to an outbreak among persons who inject drugs (PWID) in the northeast part of the state between 2016 and 2018.<sup>i</sup> Following an intensive and targeted public health response, the number of HIV infection diagnoses attributed to IDU in the northeast has decreased. However, in early 2019, a new cluster of HIV infection was identified in Boston among PWID who are experiencing or have experienced recent homelessness, renewing concerns about ongoing transmissions among PWID statewide. A total of 113 cases diagnosed since November 2018 have been investigated and identified as part of the Boston cluster. Emerging trends among those newly diagnosed in the Boston cluster (N=33 cases diagnosed in 2019) include an increase in polysubstance and methamphetamine use.<sup>ii</sup>
- From 2010 to 2019, the proportion of individuals diagnosed with HIV infection with no identified risk for exposure mode increased from 19% to 30%. Beginning in 2019, all new diagnoses of HIV infection were assigned to field epidemiologists for partner services, education, and linkage to HIV care. Please note, although field epidemiologists offer additional support in the collection of risk information as part of this process, some of the information doesn't meet the CDC-defined

<sup>i</sup> For more information, see: Charles Alpren et al. "Opioid Use Fueling HIV Transmission in an Urban Setting: An Outbreak of HIV Infection Among People Who Inject Drugs—Massachusetts, 2015–2018", *American Journal of Public Health* 110, no. 1 (January 1, 2020): pp. 37-44. <https://doi.org/10.2105/AJPH.2019.305366>

<sup>ii</sup> For more information, see: Joint MDPH and BPHC Clinical Advisory: Increase in newly diagnosed HIV infections among persons who inject drugs in Boston, March 15, 2021, available at: <https://www.mass.gov/doc/joint-mdph-and-bphc-clinical-advisory-hiv-transmission-through-injection-drug-use-in-boston-march-15-2021/download>

exposure mode categories. For example, risks occurring outside the US, such as occupational exposure, are not assigned as a primary exposure mode because it is not possible to verify the information internationally. The Massachusetts Department of Public Health will collect and maintain expanded risk information for local analyses and future use in case the CDC-defined exposure mode categories are updated.

- From 2010 to 2019, the number of HIV infection diagnoses decreased 42% among white (non-Hispanic) individuals assigned male at birth (AMAB), 7% among black (non-Hispanic) individuals AMAB, and 8% among Hispanic/Latino individuals AMAB. Among individuals assigned female at birth (AFAB), the number of diagnoses remained stable among white (non-Hispanic), decreased 41% among black (non-Hispanic), and decreased 47% among Hispanic/Latina individuals AFAB.
- From 2010 to 2019, the proportion of non-US born individuals diagnosed with HIV infection increased from 33% to 45%, while the proportion of US born individuals decreased from 61% to 52%, and the proportion of individuals born in Puerto Rico/US dependencies remained between 3% and 8%.
- From 2010 to 2019, the proportion of individuals diagnosed with HIV infection at age 20–29 years increased from 20% to 29%, while the proportion of individuals diagnosed at age 40–49 years decreased from 29% to 16%.
- The distributions of individuals diagnosed with HIV infection by sex assigned at birth remained relatively stable from 2010 to 2019.

### **Recent HIV Infection Diagnoses**

- Those with no identified risk reported (NIR) comprised the second largest exposure mode group reported to the MDPH, accounting for 27% of recent HIV infection diagnoses and consisting predominantly of individuals AMAB (67%), individuals born outside the US (53%), and individuals of black (non-Hispanic) (49%) and Hispanic/Latino (25%) ethnicity.
- One in five (21%) individuals AFAB and diagnosed with HIV infection from 2017 to 2019 reported IDU as their primary exposure mode, compared to one in eight individuals AMAB (13%).
- Black (non-Hispanic) and Hispanic/Latino individuals were diagnosed with HIV infection during 2017–2019 at rates eight and four times that of white (non-Hispanic) individuals, respectively.
- During 2017 to 2019, 38% (N=690) of all individuals diagnosed with HIV infection were born outside the US. This proportion varied by race/ethnicity: 74% of Asian/Pacific Islander individuals diagnosed with HIV infection were born outside the US, compared to 55% of black (non-Hispanic), 45% of Hispanic/Latino, and 13% of white (non-Hispanic) individuals. An additional 15% of Hispanic/Latino individuals diagnosed with HIV infection during this time period were born in Puerto Rico.

### **Persons Living with HIV Infection (PLWH)**

- Challenges to achieving health equity in the prevention and care of HIV infection remain:
  - Racial/ethnic disparities persist among PLWH, and marked differences exist by exposure mode, current gender, place of birth, and geographic region of residence in the state.
  - MSM was the most frequently reported exposure mode, accounting for 40% of PLWH overall and 56% of individuals AMAB living with HIV infection.
  - While 12% of all Massachusetts residents live in the Boston HSR, it is the current residence of 28% of PLWH.

## **Mortality Among Individuals Reported with HIV/AIDS**

- Disparities in mortality among individuals reported with HIV/AIDS paralleled those in diagnosis rates by sex assigned at birth, race/ethnicity, and place of birth, but not exposure mode. Individuals with IDU exposure mode were over-represented among HIV+ individuals who died.
- The average age at death among individuals reported with HIV/AIDS increased by 5.2 years, from 51.5 years in 2010 to 56.7 years in 2019. For comparison, the average age at death of the general Massachusetts population remained between 75.5 and 76.8 from 2010 to 2019.
- Survival of individuals diagnosed with AIDS has increased over time. In the earliest cohort of AIDS diagnoses (1985–1989), estimated survival at five years after AIDS diagnosis was 13%, compared to 89% of individuals in the most recent cohort (2015–2019).

## **Trends in Deaths Among Individuals Reported with HIV/AIDS**

- The proportion of deaths among individuals reported with HIV infection attributed to HIV-related causes decreased from 39% (N=119/303) in 2010 to 20% (N=60/298) in 2019.

## **Geographic Distribution of HIV Infection**

- The cities and towns with the highest average annual rate of HIV infection diagnosis during 2017 to 2019 included Provincetown (169.3 per 100,000), Brockton (28.5), Lowell (26.9), Lawrence (23.5), and Everett (21.2).
- Suffolk County was selected as one of 48 counties nationally that is prioritized for funding in the U.S. Health and Human Services' initiative "Ending the HIV Epidemic (EHE): A Plan for America". Suffolk County had the highest average age-adjusted annual rate of HIV infection diagnosis in Massachusetts during 2017 to 2019 at 17.0 per 100,000.

## **The Massachusetts HIV Care Continuum**

- Among individuals newly diagnosed with HIV infection in 2018, 88% overall were virally suppressed,<sup>i</sup> with 91% of those linked to care,<sup>ii</sup> and 93% of those retained in care<sup>iii</sup> suppressed. Viral suppression was lowest among individuals with injection drug use exposure mode (77%, compared to 86% to 98% among other exposure modes).
- Among persons living with HIV infection in 2019, 68% overall were virally suppressed,<sup>iv</sup> with 91% of those engaged in care<sup>v</sup> and 94% of those retained in care<sup>vi</sup> suppressed.

<sup>i</sup> "Virally Suppressed" is defined as having a VL  $\leq$ 200 copies/mL for the most recent VL test drawn during the 12-month period after diagnosis.

<sup>ii</sup> "Linked to Care" is defined as having  $\geq$ 1 viral load (VL) or CD4 test result within 3 months of diagnosis.

<sup>iii</sup> "Retained in Care" is defined as having  $\geq$ 2 VL or CD4 test results at least 3 months apart during the 12-month period after diagnosis.

<sup>iv</sup> "Virally Suppressed" is defined as having a VL  $\leq$ 200 copies/mL for the most recent VL test drawn in 2019.

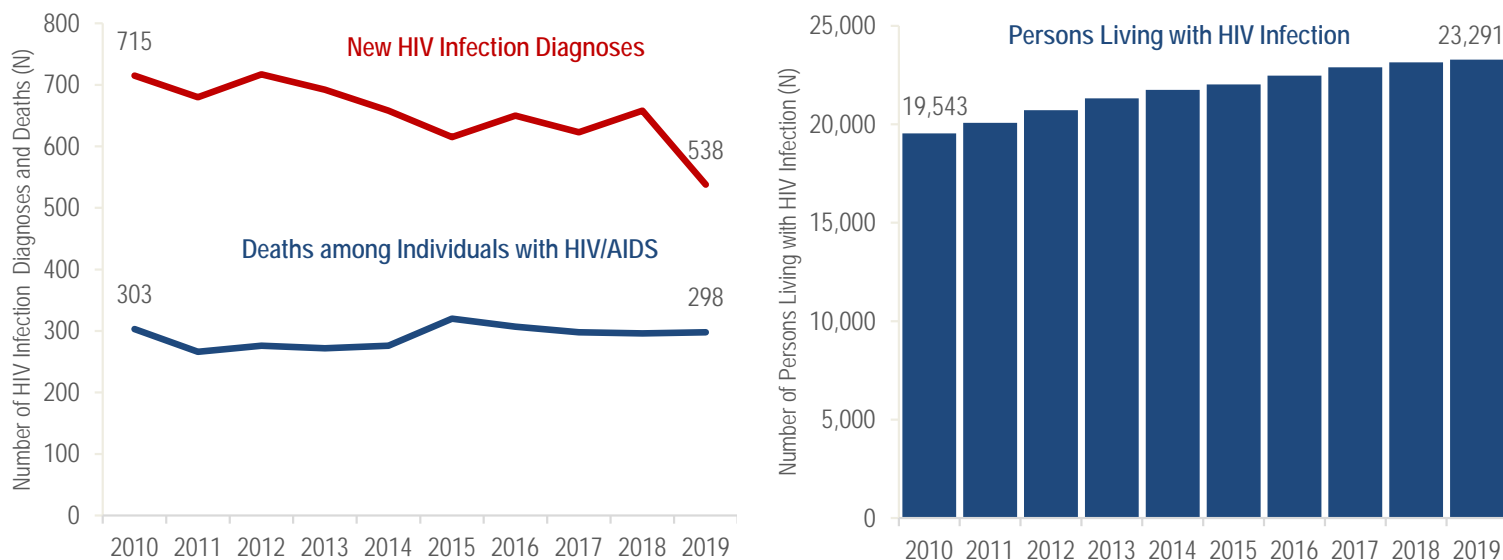
<sup>v</sup> "Engaged in Care" is defined as having  $\geq$ 1 VL or CD4 test result in 2019.

<sup>vi</sup> "Retained in Care" is defined as having  $\geq$ 2 VL or CD4 test results at least 3 months apart in 2019.

# EPIDEMIC AT A GLANCE

The number of persons living with HIV infection (PLWH) in Massachusetts increased by 19% from 19,543 in 2010 to 23,291 in 2019. After remaining relatively stable at approximately 700 diagnoses per year from 2010 to 2013 (four-year average = 701), then approximately 640 diagnoses per year from 2014 to 2018 (five-year average = 641), the number of new HIV infection diagnoses declined to a ten-year low of 538 in 2019. The number of new HIV infection diagnoses decreased by 25% from 715 in 2010 to 538 in 2019. The number of deaths due to any cause among individuals reported with HIV/AIDS remained relatively stable from 2010 to 2019, with an average of 291 deaths per year (with a low of 266 in 2011 and a high of 320 in 2015).

**FIGURE 1:** History of the HIV/AIDS epidemic, Massachusetts 2010–2019



**N=538**

New HIV infection diagnoses in MA in 2019

**N=23,291**

Persons living with HIV infection in MA as of 12/31/2019

**N=298**

Deaths among individuals reported with HIV/AIDS in MA in 2019

Men who have sex with men (MSM) continued to represent the largest proportion of new HIV infection diagnoses: 40% of all new HIV infection diagnoses in 2017–2019, and 54% among individuals AMAB.

During 2017–2019, the HIV infection diagnosis rates among black (non-Hispanic) and Hispanic/Latino individuals were eight and four times that of white (non-Hispanic) individuals, respectively.

Individuals with injection drug use (IDU) exposure mode accounted for 35% of deaths among individuals reported with HIV/AIDS in 2019 but only 16% of all PLWH.



# TRENDS IN HIV INFECTION DIAGNOSES OVER TIME

**FIGURE 2:** Trends in HIV infection diagnoses, Massachusetts 2010 – 2019

HIV Infection Diagnoses	2010	2019
<b>Total</b>	715	538
<b>Sex Assigned at Birth</b>		
Assigned Male at Birth	508	397
Assigned Female at Birth	207	141
<b>Race/Ethnicity</b>		
White NH	282	177
Black NH	225	171
Hispanic/Latino	182	147
API	24	18
Other/Unknown	2	25
<b>Age Group (Years)</b>		
0-12	6	0
13-19	12	12
20-29	141	154
30-39	194	158
40-49	204	86
50-59	122	73
60-69	33	42
70+	3	13
<b>Exposure Mode</b>		
MSM	304	226
IDU	66	60
MSM/IDU	26	17
HTSX	91	37
Other <sup>i</sup>	6	0
Pres. HTSX	87	39
NIR	135	159
<b>Place of Birth</b>		
US	439	281
PR/USD <sup>ii</sup>	43	17
Non-US	233	240
<b>Health Service Region</b>		
Boston	215	132
Central	60	62
Metro West	120	87
Northeast	117	112
Southeast	95	87
Western	80	47
Prisoner	27	10
Other/Unknown	1	1

## Overall

The number of new HIV infection diagnoses decreased by 25% from 715 in 2010 to 538 in 2019.

## By Sex Assigned at Birth

HIV infection diagnoses decreased by 22% (from 508 to 397) among individuals AMAB and by 32% (from 207 to 141) among individuals AFAB.

## By Race/Ethnicity

From 2010 to 2019, HIV infection diagnoses among white (non-Hispanic) individuals decreased by 37% (from 282 to 177), among black (non-Hispanic) individuals decreased by 24% (from 225 to 171), among Hispanic/Latino individuals decreased by 19% (from 182 to 147), and among Asian/Pacific Islander individuals decreased by 25% (from 24 to 18).

## By Age at HIV Infection Diagnosis

HIV infection diagnoses in Massachusetts from 2010 to 2019 decreased among 40–49 year-olds by 58% (from 204 to 86), among 50–59 year-olds by 40% (from 122 to 73), and among 30–39 year-olds by 19% (from 194 to 158). The number of HIV infection diagnoses among 0–12 year-olds decreased from six to zero. HIV infection diagnoses among 60–69 year-olds increased by 27% (from 33 to 42) and among 20–29 year-olds slightly by 9% (from 141 to 154). While small, the number of diagnoses among 70+ year-olds increased from three to 13, and the number among 13–19 year-olds remained relatively stable.

## By Exposure Mode

From 2010 to 2019, HIV infection diagnoses decreased among individuals with heterosexual (59%, from 91 to 37), presumed heterosexual (55%, from 87 to 39), male-to-male sex, (26%, from 304 to 226), and “other” exposure modes (from 6 to 0). All diagnoses in the other category were related to pediatric exposures, with no confirmed clotting factor, transfusion, or transplant-related exposures in the ten-year time period. After declining by 53% from 2010 (N=66) to 2014 (N=31), the number of reported cases with injection drug use (IDU) as the primary exposure mode peaked at 116 in 2017 and then decreased to 60 in 2019. This was primarily due to an outbreak among PWID in the northeast part of the state between 2016 and 2018, followed by an intensive and targeted public health response.<sup>iii</sup>

<sup>i</sup> All individuals diagnosed with HIV infection from 2010-2019 with other exposure mode were pediatric exposures

<sup>ii</sup> 99.7% of individuals diagnosed with HIV infection from 2010–2019 who were born in a US dependency were born in Puerto Rico

<sup>iii</sup> For more information, see: Charles Alpren et al. “Opioid Use Fueling HIV Transmission in an Urban Setting: An Outbreak of HIV Infection Among People Who Inject Drugs—Massachusetts, 2015–2018”, *American Journal of Public Health* 110, no. 1 (January 1, 2020): pp. 37-44.

<https://doi.org/10.2105/AJPH.2019.305366>



**FIGURE 3: Trends in HIV infection diagnoses by sex assigned at birth, Massachusetts 2010 – 2019**

**Assigned Male at Birth**

HIV Infection Diagnoses	2010	2019
<b>Total</b>	508	397
<b>Race/Ethnicity</b>		
White NH	246	142
Black NH	113	105
Hispanic/Latino	129	119
API	19	16
Other/Unknown	1	15
<b>Age Group (Years)</b>		
0-12	3	0
13-19	7	10
20-29	106	125
30-39	132	122
40-49	156	65
50-59	81	47
60-69	21	22
70+	2	6
<b>Exposure Mode</b>		
MSM	304	226
IDU	41	36
MSM/IDU	26	17
HTSX	30	14
Other <sup>i</sup>	3	0
NIR	104	104
<b>Place of Birth</b>		
US	360	225
PR/USD <sup>ii</sup>	32	16
Non-US	116	156

**Assigned Female at Birth**

HIV Infection Diagnoses	2010	2019
<b>Total</b>	207	141
<b>Race/Ethnicity</b>		
White NH	36	35
Black NH	112	66
Hispanic/Latina	53	28
API	5	2
Other/Unknown	1	10
<b>Age Group (Years)</b>		
0-12	3	0
13-19	5	2
20-29	35	29
30-39	62	36
40-49	48	21
50-59	41	26
60-69	12	20
70+	1	7
<b>Exposure Mode</b>		
IDU	25	24
HTSX	61	23
Other <sup>i</sup>	3	0
Pres. HTSX	87	39
NIR	31	55
<b>Place of Birth</b>		
US	79	56
PR/USD <sup>ii</sup>	11	1
Non-US	117	84

**Race/Ethnicity by Sex Assigned at Birth**

From 2010 to 2019, the number of HIV infection diagnoses decreased 42% among white (non-Hispanic) individuals assigned male at birth (AMAB), 7% among black (non-Hispanic) individuals AMAB, and 8% among Hispanic/Latino individuals AMAB. Among individuals assigned female at birth (AFAB), the number of diagnoses remained stable among white (non-Hispanic) individuals AFAB, decreased 41% among black (non-Hispanic) individuals AFAB, and decreased 47% among Hispanic/Latina individuals AFAB.

**Exposure Mode by Sex Assigned at Birth**

The number of HIV infection diagnoses decreased among all exposure modes for individuals AMAB except for no identified risk, which remained stable. The number of diagnoses with no identified risk increased by 77% among individuals AFAB, while the number of diagnoses with injection drug use exposure mode remained stable. The number of HIV infection diagnoses decreased among individuals AFAB with presumed heterosexual and heterosexual exposure.

**Place of Birth by Sex Assigned at Birth**

From 2010 to 2019, the number of HIV infection diagnoses among individuals AMAB and born outside the US increased by 34%, while the number born in the US and Puerto Rico/US Dependencies decreased. The number of diagnoses among individuals AFAB decreased for all categories of birthplace.

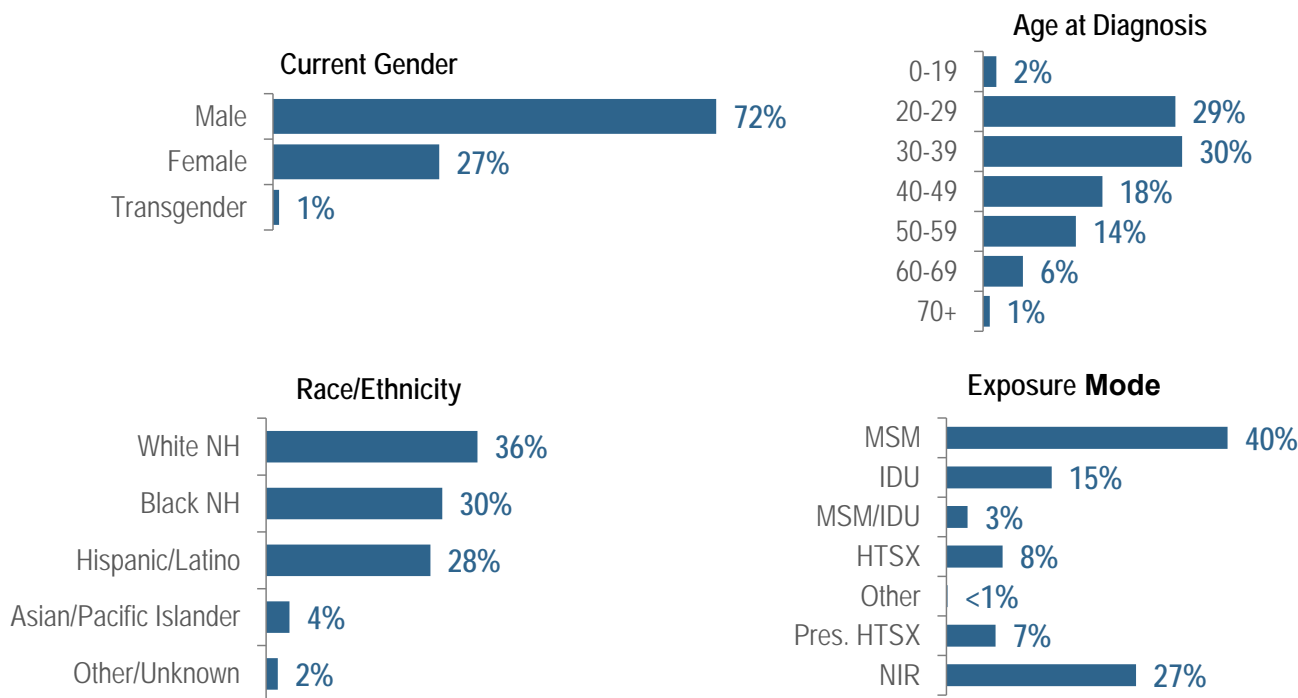
<sup>i</sup> All individuals diagnosed with HIV infection from 2010-2019 with other exposure mode were pediatric exposures

<sup>ii</sup> One hundred percent of individuals diagnosed with HIV infection from 2010-2019 who were born in a US dependency (USD) were born in Puerto Rico (PR)

# RECENT HIV INFECTION DIAGNOSES

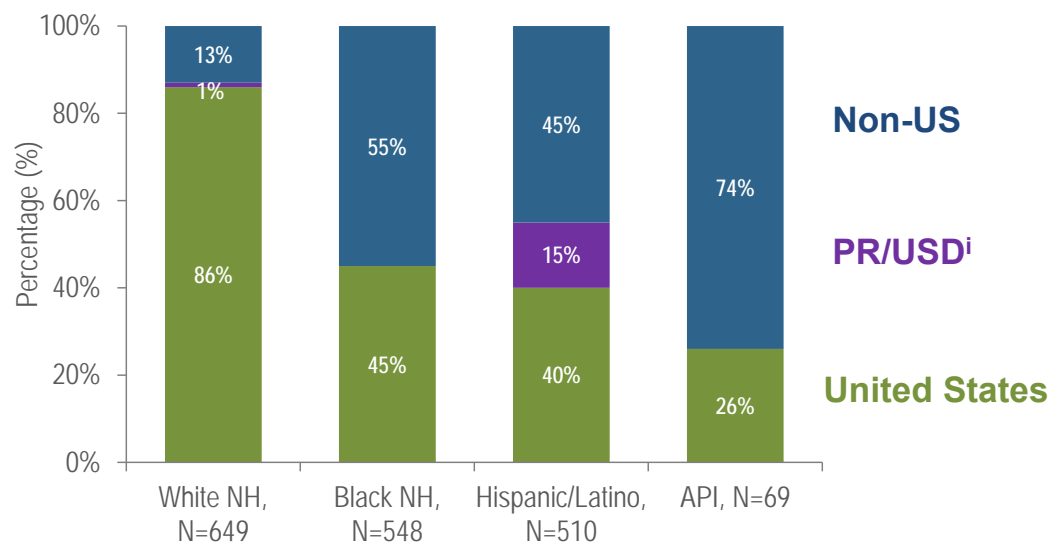
Who is most at risk for HIV infection? Recent HIV infection diagnoses are the best available indicator for who is most at risk for HIV infection. Monitoring new diagnoses helps us to determine who is affected and inform effective prevention activities.

**FIGURE 4.** Percentage of individuals diagnosed with HIV infection by current gender, age, race/ethnicity, and exposure mode, Massachusetts 2017 – 2019 (N=1,819)



The number of individuals diagnosed with HIV infection has decreased over the past decade in Massachusetts, but disparities persist by current gender, age, race/ethnicity, and exposure mode. Individuals newly diagnosed with HIV infection in Massachusetts during 2017–2019 were predominantly male (72%), young (29% 20–29 year-olds and 30% 30–39 year-olds), white (non-Hispanic) (36%), with an exposure mode of MSM (40%). While MSM was the leading exposure mode, a large percentage of new HIV infection diagnoses had no identified risk (27%).

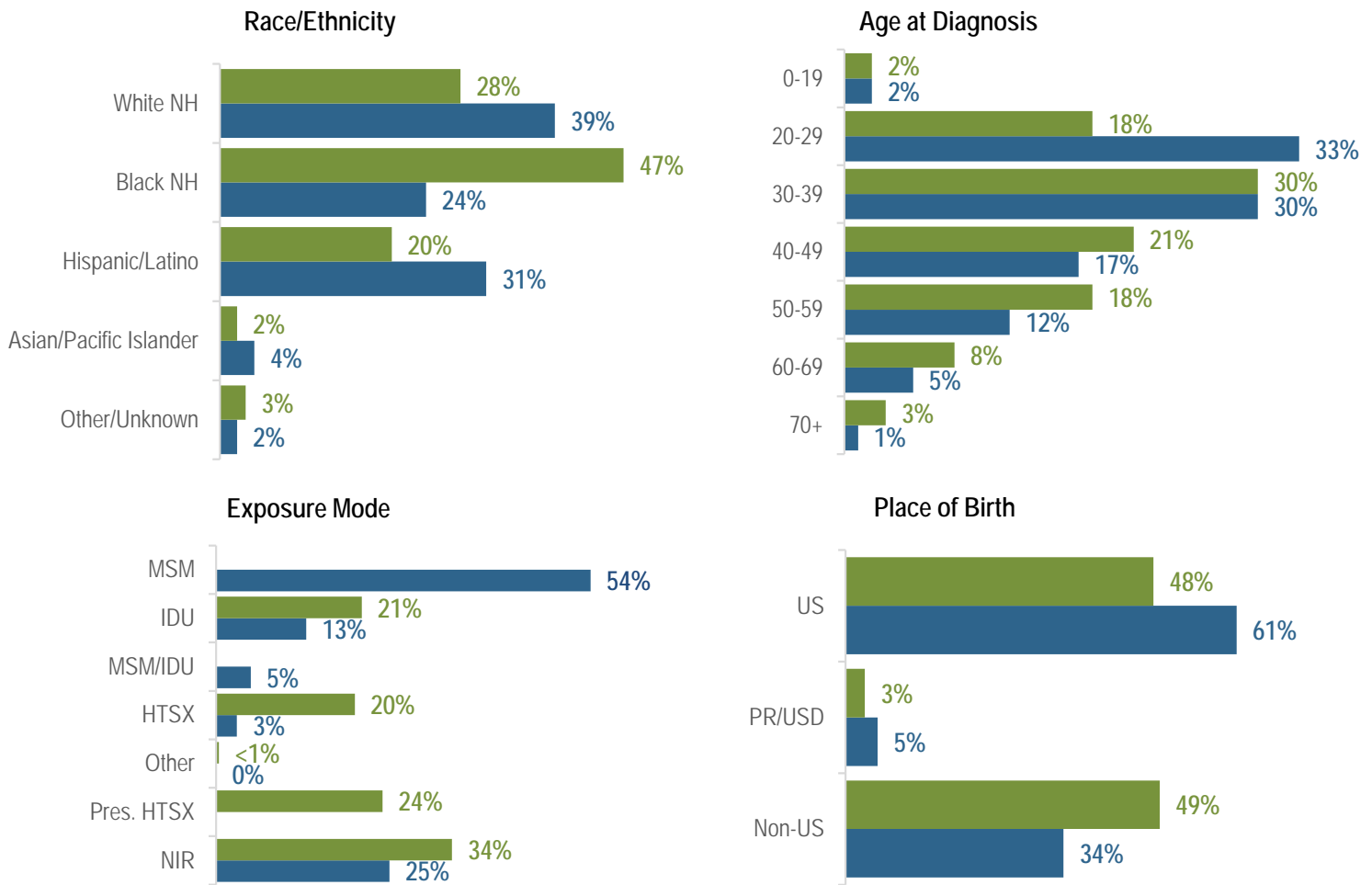
**FIGURE 5.** Percentage of individuals diagnosed with HIV infection by race/ethnicity and place of birth, Massachusetts 2017 – 2019



Seventy-four percent of Asian/Pacific Islander individuals diagnosed with HIV infection during 2017–2019 were born outside the US, compared to 55% of black (non-Hispanic), 45% of Hispanic/Latino, and 13% of white (non-Hispanic) individuals.

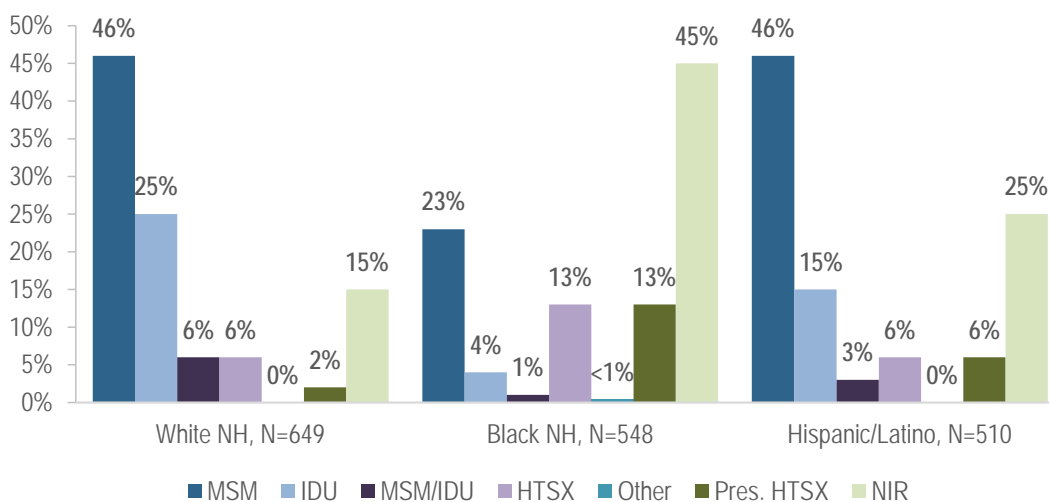
<sup>1</sup> All individuals diagnosed with HIV infection from 2017–2019 who were born in a US dependency (USD) were born in Puerto Rico (PR)

**FIGURE 6.** Percentage of individuals diagnosed with HIV infection by race/ethnicity, age, exposure mode, and place of birth by sex assigned at birth, Massachusetts 2017 – 2019 (AFAB, N=490; AMAB, N=1,329)



The distributions of new HIV infection diagnoses by race/ethnicity, age, exposure mode and place of birth varied by sex assigned at birth: the largest proportion of individuals assigned male at birth (AMAB) was white (non-Hispanic) (39%), while the largest proportion of individuals assigned female at birth (AFAB) was black (non-Hispanic) (47%); a larger proportion of individuals AMAB (33%) than AFAB (18%) was diagnosed between the ages of 20 and 29 years. MSM was the predominant exposure mode among individuals AMAB (54%), while the largest proportion of individuals AFAB was reported with NIR (34%). A larger proportion of individuals AFAB (49%) than AMAB (34%) was born outside the US.

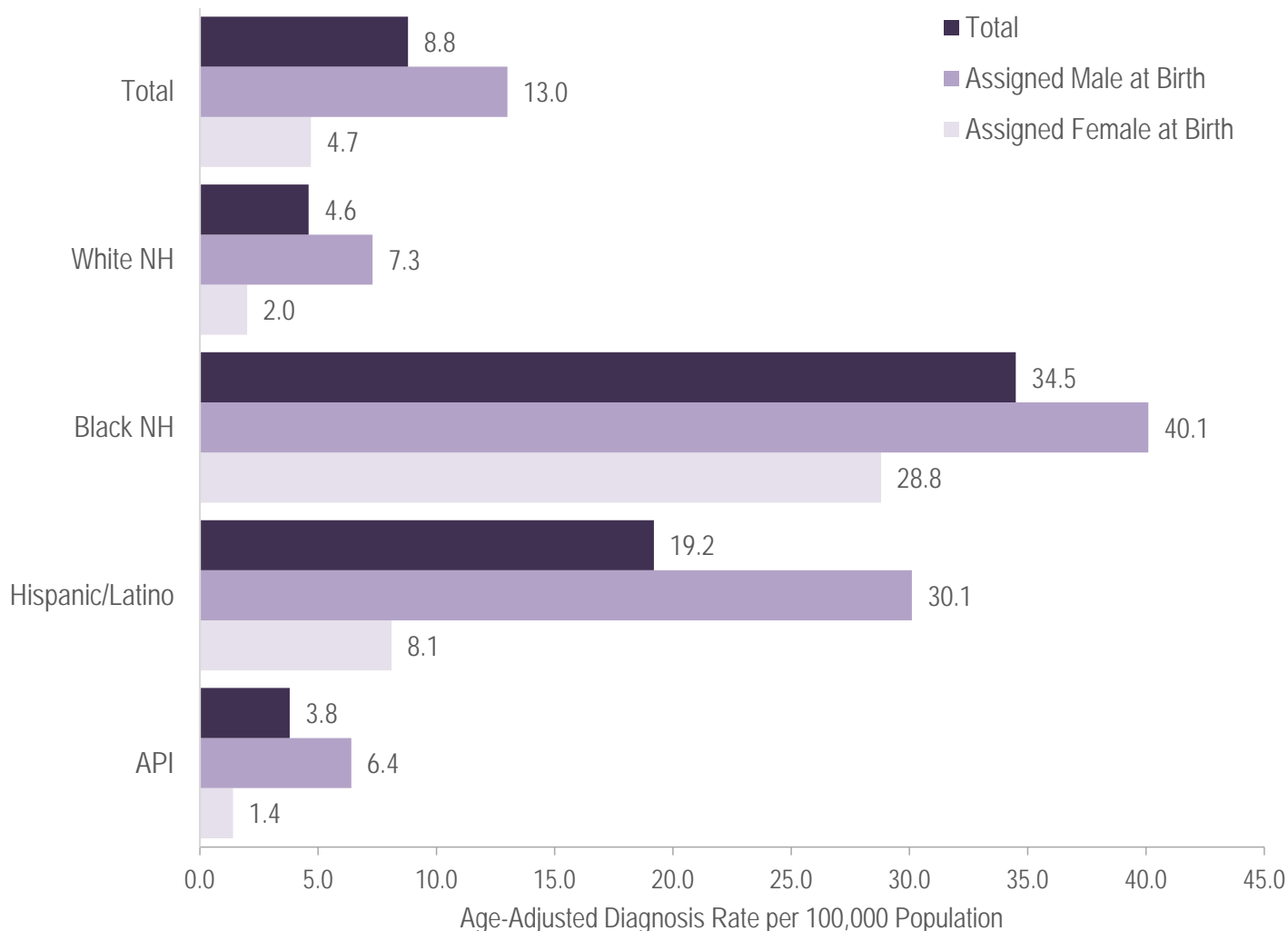
**FIGURE 7.** Percentage of individuals diagnosed with HIV infection by exposure mode and race/ethnicity, Massachusetts 2017 – 2019



While the predominant exposure mode among white (non-Hispanic) and Hispanic/Latino individuals recently diagnosed with HIV infection was MSM (both 46%), the largest proportion of black (non-Hispanic) individuals was assigned no identified risk for exposure mode (45%).

*HIV does not affect all Massachusetts residents equally. One way to understand which populations are experiencing differential impacts is to compare rates of HIV diagnosis per 100,000 population.*

**FIGURE 8.** Average annual age-adjusted HIV diagnosis rates per 100,000 population<sup>i</sup> by sex assigned at birth and race/ethnicity, Massachusetts 2017–2019 (N=1,819)



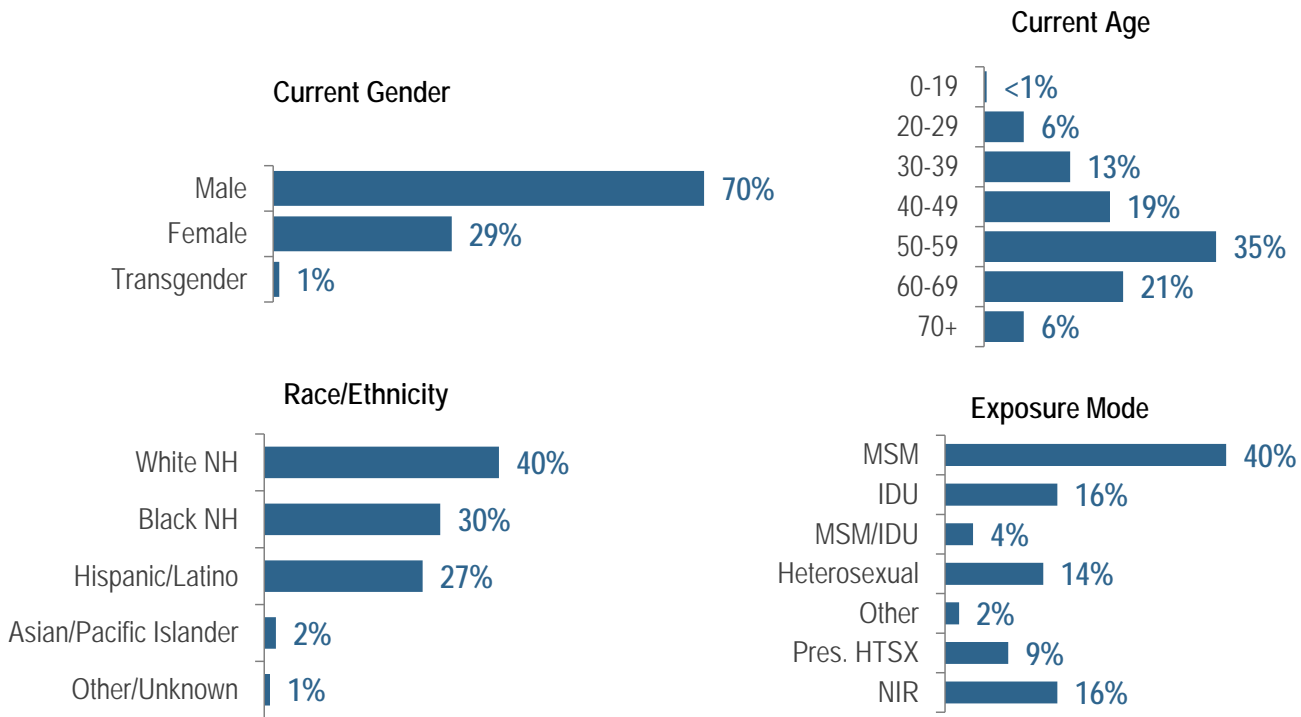
<sup>i</sup> As of 1/1/2020, BIDLS calculates rates per 100,000 population using denominators estimated by the University of Massachusetts Donahue Institute using a modified Hamilton-Perry model (Strate S, et al. Small Area Population Estimates for 2011 through 2020, report published Oct 2016). Note that rates and trends calculated using previous methods cannot be compared to these. All rates are age-adjusted using the 2000 US standard population.

In 2017–2019, the average annual age-adjusted HIV diagnosis rate per 100,000 population of individuals assigned male at birth (AMAB) was three times that of individuals assigned female at birth (AFAB). There were large disparities in age-adjusted HIV diagnosis rates by race/ethnicity: the rates among black (non-Hispanic) individuals and Hispanic/Latino individuals were eight and four times that of white (non-Hispanic) individuals, respectively. The average annual age-adjusted HIV diagnosis rates for 2017 to 2019 among black (non-Hispanic) and Hispanic/Latina individuals AFAB were 14 and four times that of white (non-Hispanic) individuals AFAB, respectively. Among black (non-Hispanic) and Hispanic/Latino individuals AMAB, the average annual age-adjusted HIV diagnosis rates were five and four times greater than the rate among white (non-Hispanic) individuals AMAB, respectively.

# PERSONS LIVING WITH HIV INFECTION

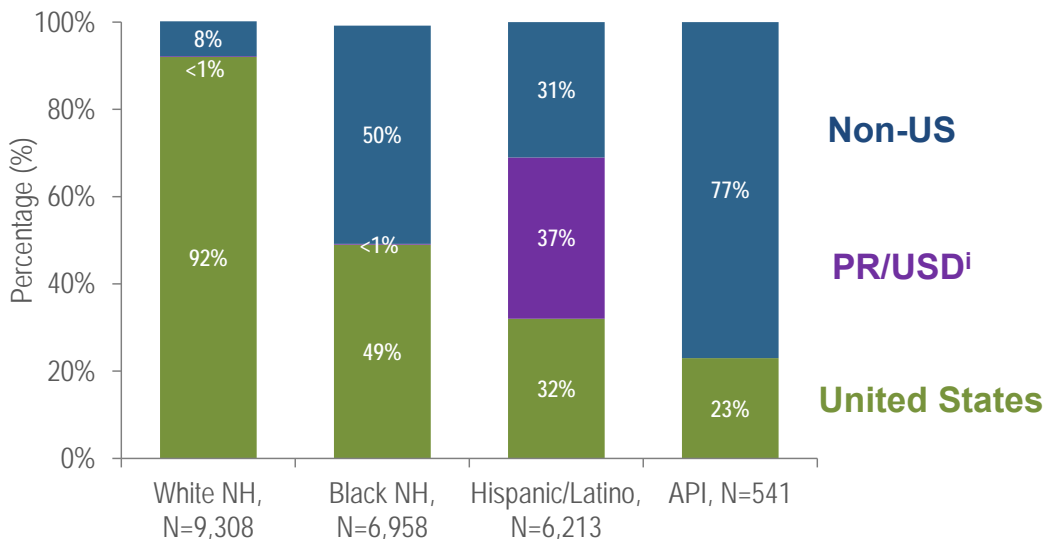
Who is currently living with HIV infection? The number of persons living with HIV infection (PLWH) reflects the burden of HIV in Massachusetts.

**FIGURE 9.** Percentage of PLWH by current gender, age, race/ethnicity, and exposure mode, Massachusetts 2019 (N=23,291)



Racial/ethnic disparities persist among PLWH, and marked differences exist by current gender, age, exposure mode, and place of birth. PLWH in Massachusetts are predominantly male (70%), older (35% among 50–59 year-olds), and white non-Hispanic (40%). Male-to-male sex was the most frequently reported exposure mode, at 40%.

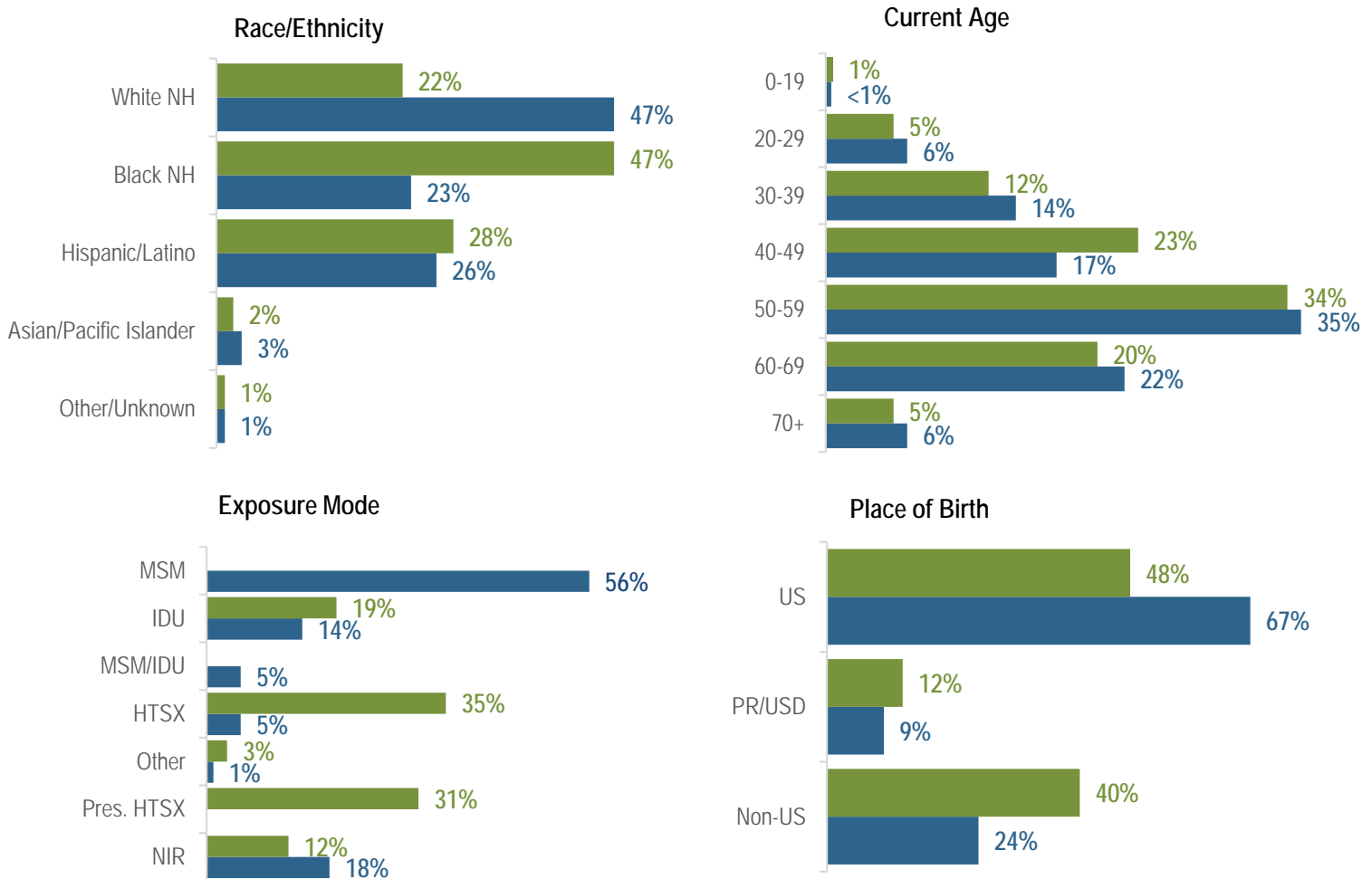
**FIGURE 10.** Percentage of PLWH by race/ethnicity and place of birth, Massachusetts 2019



A total of 77% of Asian/Pacific Islander PLWH in Massachusetts as of 12/31/2019 were born outside the US, compared to 50% of black (non-Hispanic), 31% of Hispanic/Latino, and 8% of white (non-Hispanic) PLWH.

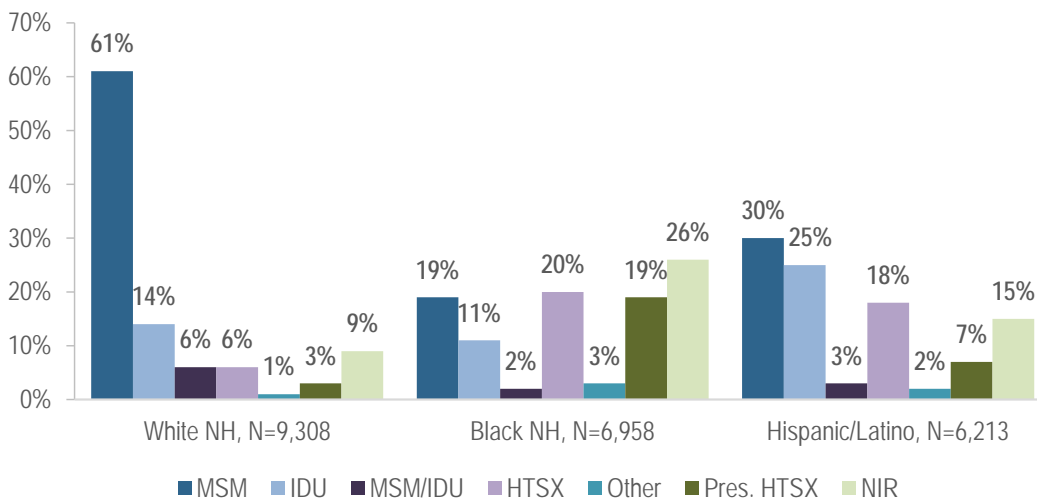
<sup>i</sup> 98% of PLWH on 12/31/19 who were born in a US dependency were born in Puerto Rico

**FIGURE 11.** Percentage of persons living with HIV infection (PLWH): race/ethnicity, age, exposure mode, and place of birth by sex assigned at birth, Massachusetts 2019  
 (Assigned Female at Birth, N=6,678; Assigned Male at Birth, N=16,613)



The distributions of PLWH by race/ethnicity, exposure mode, and place of birth varied by sex assigned at birth: the largest proportion of individuals assigned male at birth (AMAB) living with HIV infection was white (non-Hispanic) (47%), while the largest proportion of individuals assigned female at birth (AFAB) was black (non-Hispanic) (47%). MSM (56%) was the predominant exposure mode among individuals AMAB compared to heterosexual sex (35%) and presumed heterosexual sex (31%) among individuals AFAB. The majority (67%) of individuals AMAB were born in the US, while just under half of individuals AFAB were born in US (48%) and 40% were born outside the US.

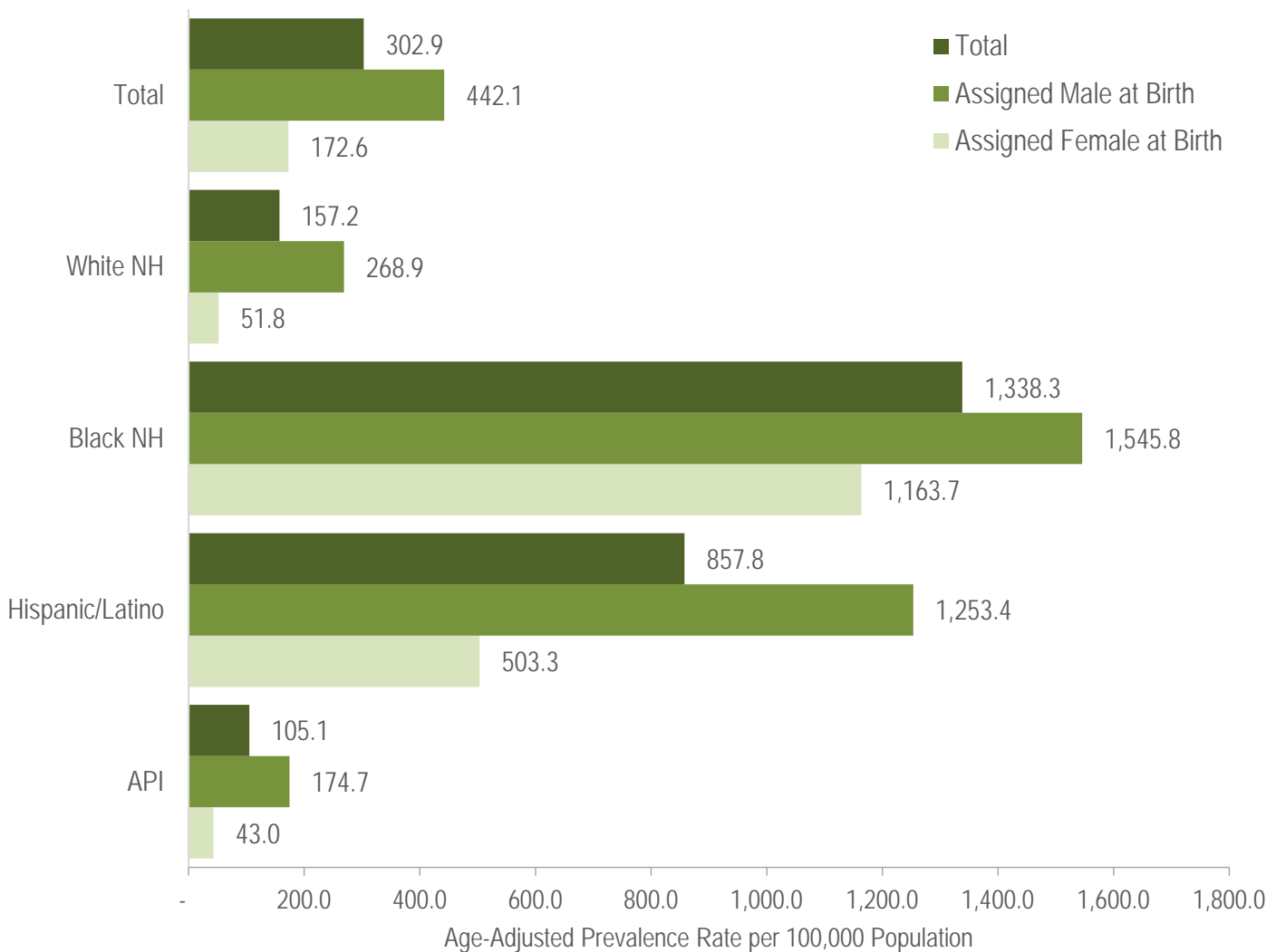
**FIGURE 12.** Percentage of PLWH by exposure mode and race/ethnicity, Massachusetts 2019



The predominant exposure mode among white (non-Hispanic) PLWH was MSM (61%). Among black (non-Hispanic) PLWH, the largest proportion was reported with no identified risk (26%), followed by heterosexual sex (20%), presumed heterosexual sex (19%), and MSM (19%). Among Hispanic/Latino PLWH, the largest proportion was MSM (30%), followed by IDU (25%).



**FIGURE 13.** Age-adjusted HIV prevalence rates per 100,000 population<sup>i</sup> by sex assigned at birth and race/ethnicity, Massachusetts 2019 (N= 23,291)



<sup>i</sup> As of 1/1/2020, BIDLS calculates rates per 100,000 population using denominators estimated by the University of Massachusetts Donahue Institute using a modified Hamilton-Perry model (Strate S, et al. Small Area Population Estimates for 2011 through 2020, report published Oct 2016). Note that rates and trends calculated using previous methods cannot be compared to these. All rates are age-adjusted using the 2000 US standard population.

In 2019, the age-adjusted HIV prevalence rate per 100,000 population of individuals assigned male at birth (AMAB) was three times that of individuals assigned female at birth (AFAB). There were large disparities in age-adjusted HIV prevalence rates by race/ethnicity: the rates among black (non-Hispanic) individuals and Hispanic/Latino individuals were nine and five times that of white (non-Hispanic) individuals, respectively. The age-adjusted HIV prevalence rates among black (non-Hispanic) and Hispanic/Latina individuals AFAB were 22 and 10 times greater than the rate among white (non-Hispanic) individuals AFAB, respectively. Among black (non-Hispanic) and Hispanic/Latino individuals AMAB, the age-adjusted HIV prevalence rates were six and five times greater than the rate among white (non-Hispanic) individuals AMAB, respectively.

There were an estimated 24,600 (95% confidence interval: 23,500 - 25,600) persons living with HIV infection in Massachusetts. This estimate includes the 23,291 individuals diagnosed with HIV infection, reported to MDPH, and presumed to be living in Massachusetts, plus an estimated number of undiagnosed and unreported individuals.<sup>i</sup>

<sup>i</sup> Data source for HIV prevalence estimate: Massachusetts Department of Public Health (MDPH), Bureau of Infectious Disease and Laboratory Sciences (BIDLS), using CDC's methodology for estimating HIV prevalence. For more information see Centers for Disease Control and Prevention. Estimated HIV incidence and prevalence in the United States, 2015–2019. HIV Surveillance Supplemental Report 2021;26(No. 1). <http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html>. Published May 2021

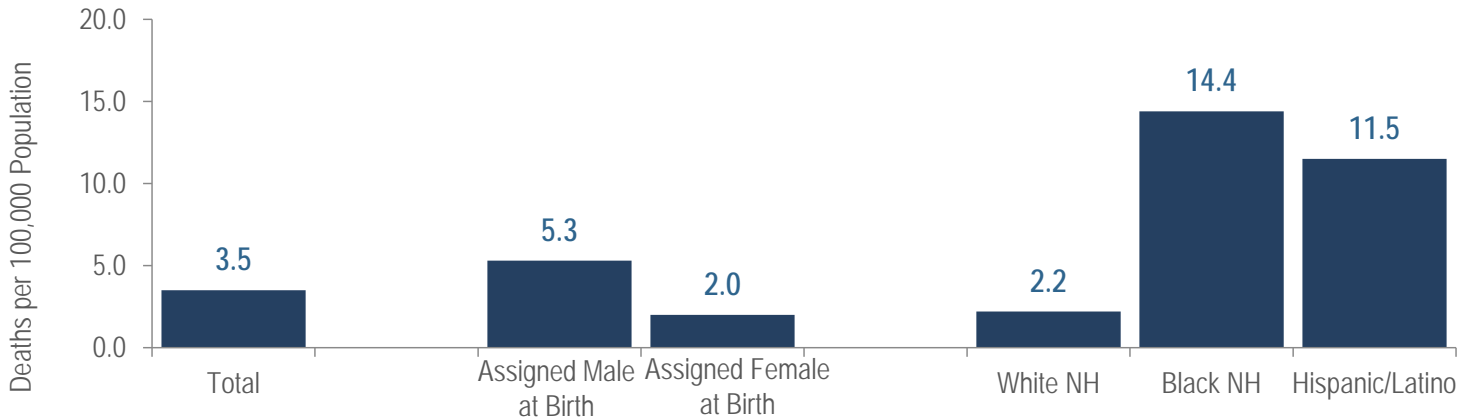


# MORTALITY AMONG INDIVIDUALS WITH HIV/AIDS

*Who is dying with HIV/AIDS and how has this changed over time?*

HIV/AIDS was the 31<sup>st</sup> leading cause of death in Massachusetts in 2019. HIV/AIDS was the 17<sup>th</sup> leading cause of death for black (non-Hispanic) individuals, the 19<sup>th</sup> leading cause of death for Hispanic/Latino individuals, and the 34<sup>th</sup> leading cause of death for white (non-Hispanic) individuals. Among 25–44 year-olds, HIV/AIDS was the 16<sup>th</sup> leading cause of death in 2019.\*

**FIGURE 14.** Average annual age-adjusted death rates among individuals reported with HIV/AIDS per 100,000 population<sup>1</sup> by sex assigned at birth and race/ethnicity, Massachusetts 2017–2019 (Total number of deaths among individuals reported with HIV/AIDS from 2017–2019=892)



<sup>1</sup> As of 1/1/2020, BIDLs calculates rates per 100,000 population using denominators estimated by the University of Massachusetts Donahue Institute using a modified Hamilton-Perry model (Strate S, et al. Small Area Population Estimates for 2011 through 2020, report published Oct 2016). Note that rates and trends calculated using previous methods cannot be compared to these. All rates are age-adjusted using the 2000 US standard population.

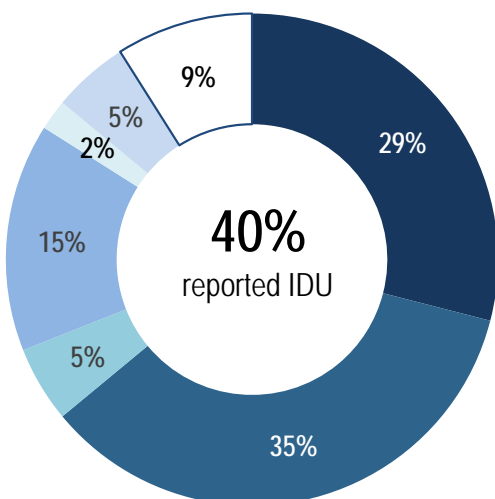
## Age-Adjusted Rates

In 2017–2019, the average annual age-adjusted death rate per 100,000 population for individuals assigned male at birth reported with HIV/AIDS was three times that for individuals assigned female at birth. There were also large disparities in death rates by race/ethnicity: the rates among black (non-Hispanic) individuals and Hispanic/Latino individuals were seven and five times that of white (non-Hispanic) individuals, respectively.

## Age at Death

The average age at death among individuals reported with HIV/AIDS increased by 5.2 years, from 51.5 years in 2010 to 56.7 years in 2019. For comparison, the average age at death of the general Massachusetts population remained between 75.5 and 76.8 from 2010 to 2019.\*

**FIGURE 15.** Deaths among individuals reported with HIV/AIDS by exposure mode, Massachusetts 2019 (N=298)



## Exposure Mode

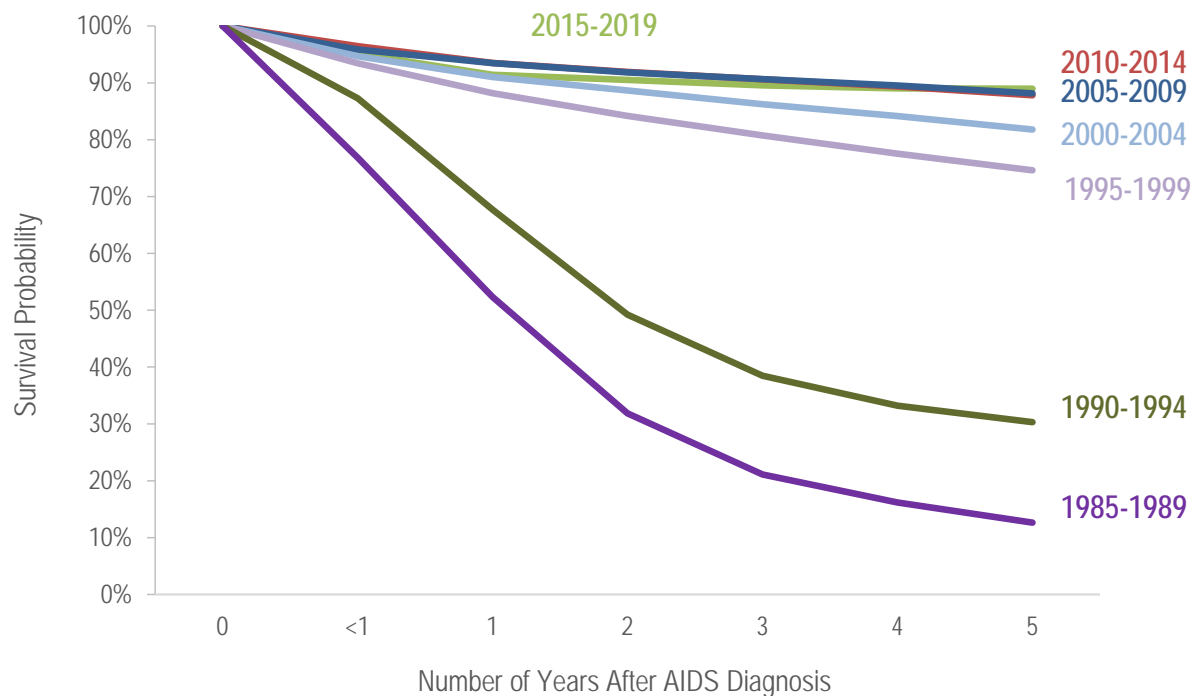
Individuals with IDU exposure mode accounted for the largest proportion of deaths among individuals reported with HIV/AIDS. In 2019, 35% of deaths among individuals with HIV/AIDS were reported with an exposure mode of IDU and an additional 5% were reported with an exposure mode of MSM/IDU, compared to 11% and 3%, respectively, of 2019 HIV infection diagnoses.

■ MSM ■ IDU ■ MSM/IDU ■ HTSX ■ Other ■ Pres. HTSX □ NIR

## Survival among individuals diagnosed with AIDS

Survival of individuals diagnosed with AIDS has increased over time. In the earliest cohort of AIDS diagnoses (1985–1989), estimated survival at five years after AIDS diagnosis was 13%, compared to 89% in the most recent cohort (2015–2019).

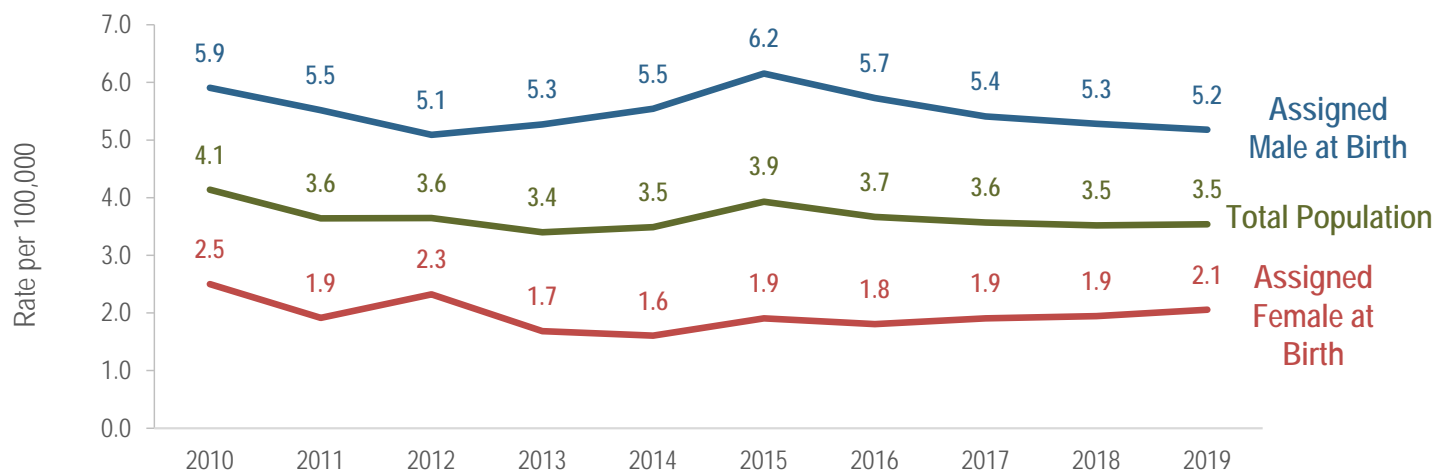
**FIGURE 16.** Five-year survival among with individuals with AIDS by year of diagnosis, Massachusetts 1985–2019 (Total number of AIDS diagnoses from 1985–2019, N=25,131)



## Trends in Age-Adjusted Rates of Death

Over the last 10 years of available data, the age-adjusted rate of death per 100,000 population of individuals assigned male at birth (AMAB) reported with HIV/AIDS has remained two to three times that of individuals assigned female at birth (AFAB). In 2019, the age-adjusted rate of individuals AMAB (5.2 per 100,000) was two and a half times the rate of individuals AFAB (2.1 per 100,000).

**FIGURE 17.** Age-adjusted rate of death per 100,000 population<sup>i</sup> among individuals reported with HIV/AIDS by sex assigned at birth, Massachusetts 2010–2019 (Total number of deaths among individuals reported with HIV/AIDS from 2010–2019=2,912)



<sup>i</sup> As of 1/1/2020, BIDLs calculates rates per 100,000 population using denominators estimated by the University of Massachusetts Donahue Institute using a modified Hamilton-Perry model (Strate S, et al. Small Area Population Estimates for 2011 through 2020, report published Oct 2016). Note that rates and trends calculated using previous methods cannot be compared to these. All rates are age-adjusted using the 2000 US standard population.

# TRENDS IN DEATHS AMONG INDIVIDUALS WITH HIV/AIDS

The proportion of deaths among individuals reported with HIV infection attributed to HIV-related causes decreased from 39% (N=119/303) in 2010 to 20% (N=60/298) in 2019.

**FIGURE 18.** Trends in all-cause deaths among individuals reported with HIV/AIDS, Massachusetts 2010–2019

All-Cause Deaths	2010	2019
<b>Total</b>	303	298
<b>Sex Assigned at Birth</b>		
Assigned Male at Birth	212	210
Assigned Female at Birth	91	88
<b>Race/Ethnicity</b>		
White NH	140	130
Black NH	74	85
Hispanic/Latino	83	77
API	3	2
Other/Unknown	3	4
<b>Age Group (Years)</b>		
0-12	0	0
13-19	0	0
20-29	5	12
30-39	19	16
40-49	100	31
50-59	118	118
60-69	52	89
70+	9	32
<b>Exposure Mode</b>		
MSM	67	85
IDU	144	104
MSM/IDU	15	16
HTSX	23	45
Other <sup>i</sup>	4	7
Pres. HTSX	11	15
NIR	39	26
<b>Place of Birth</b>		
US	229	222
PR/USD <sup>ii</sup>	48	41
Non-US	26	35

<sup>i</sup> Other includes perinatal and clotting factor /transfusion/transplant-related exposures

<sup>ii</sup> Ninety-nine percent of individuals reported with HIV/AIDS who died from 2010–2019 who were born in a US dependency (USD) were born in Puerto Rico (PR)

## Overall

The number of deaths due to any cause among individuals reported with HIV/AIDS remained relatively stable from 2010 to 2019, with an average of 291 deaths per year (with a low of 266 in 2011 and a high of 320 in 2015).

## By Sex Assigned at Birth

From 2010 to 2019, the annual number of deaths remained relatively stable among both individuals assigned female and male at birth.

## By Race/Ethnicity

From 2010 to 2019, the annual number of deaths increased by 15% among black (non-Hispanic) individuals reported with HIV/AIDS and decreased slightly by 7% among both Hispanic/Latino individuals and white (non-Hispanic) individuals.

## By Age at Death

From 2010 to 2019, there were few deaths among the youngest age groups (0–12 and 13–19). Deaths decreased by 69% among the 40–49 year age group, 16% among the 30–39 year age group, and remained stable among the 50–59 year age group. Deaths increased by 71% among the 60–69 year age group, more than doubled among the 20–29 year age group, and more than tripled among the 70+ year age group.

## By Exposure Mode

From 2010 to 2019, annual deaths decreased by 28% among individuals with primary IDU exposure mode and by 33% among individuals with no identified risk. Deaths increased among individuals with MSM (by 27%), heterosexual (by 96%), and presumed heterosexual (by 36%) exposure modes. Deaths among individuals with MSM/IDU exposure mode remained relatively stable.

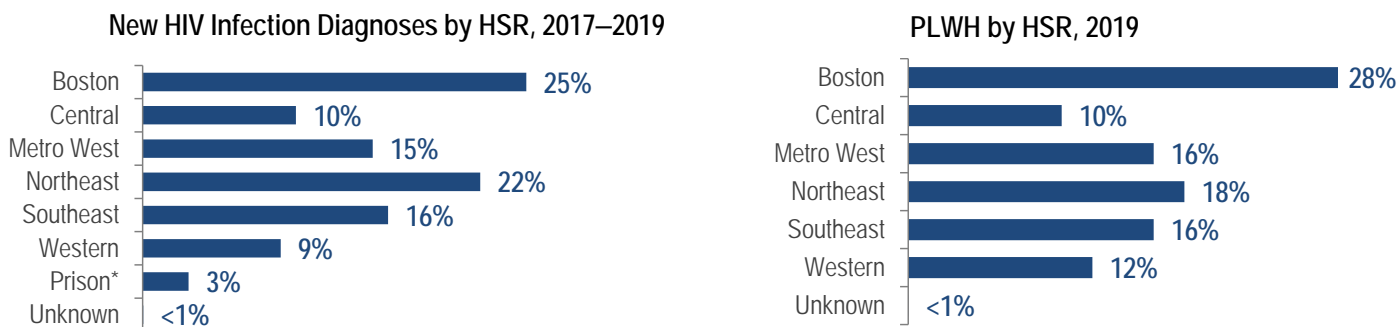
## By Place of Birth

From 2010 to 2019, the annual number of deaths among individuals with HIV/AIDS born outside the US increased by 35%, while the number among individuals born in the US remained relatively stable and born in Puerto Rico/US dependencies decreased by 15%.

# GEOGRAPHIC DISTRIBUTION OF HIV INFECTION

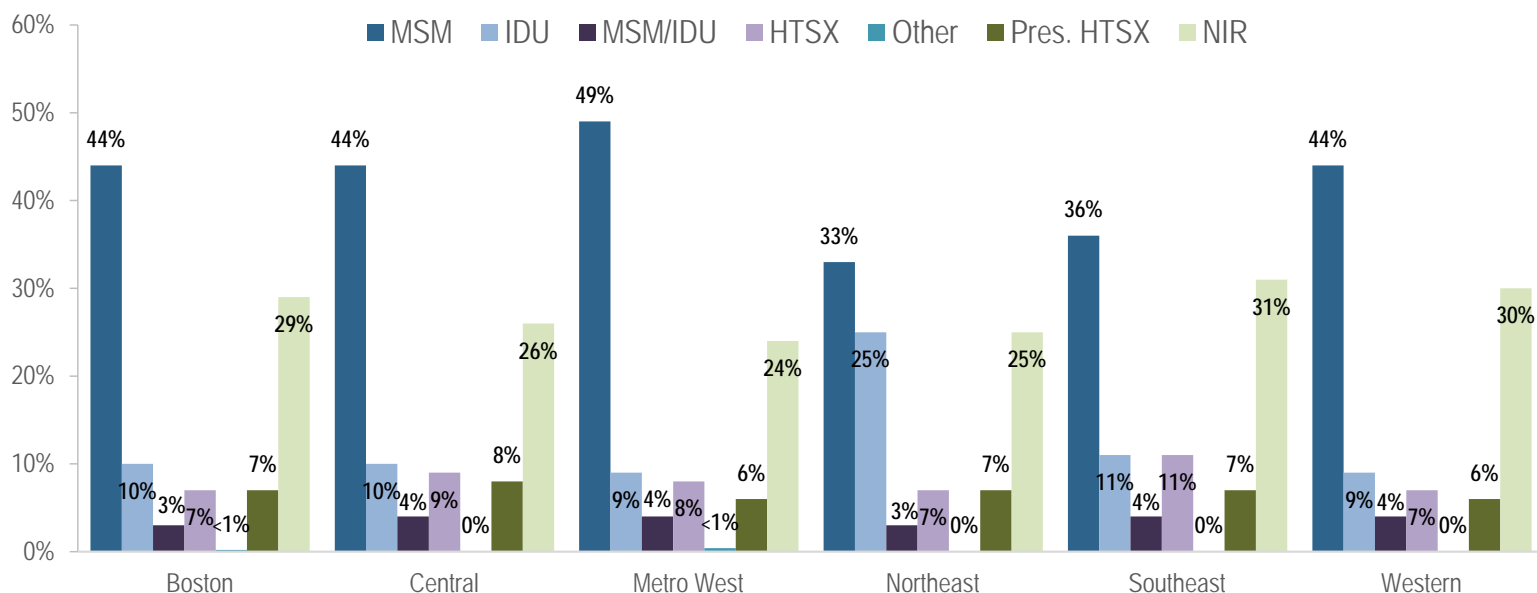
*What is the geographic distribution of the HIV/AIDS epidemic in Massachusetts?*

**FIGURE 19.** Percentage distributions of 2017–2019 HIV infection diagnoses (N=1,819) and 2019 persons living with HIV infection (PLWH, N=23,291) by Health Service Region (HSR), Massachusetts



The largest proportion of new HIV infection diagnoses in 2017–2019 was among residents of the Boston HSR (25%), followed by the Northeast HSR (22%), the Southeast HSR (16%), and the Metro West HSR (15%). Similar geographic distributions were observed for persons living with HIV infection (PLWH). The Boston HSR had the largest proportion of PLWH in 2019 (28%), followed by the Northeast HSR (18%), and the Southeast and Metro West HSRs (both 16%).

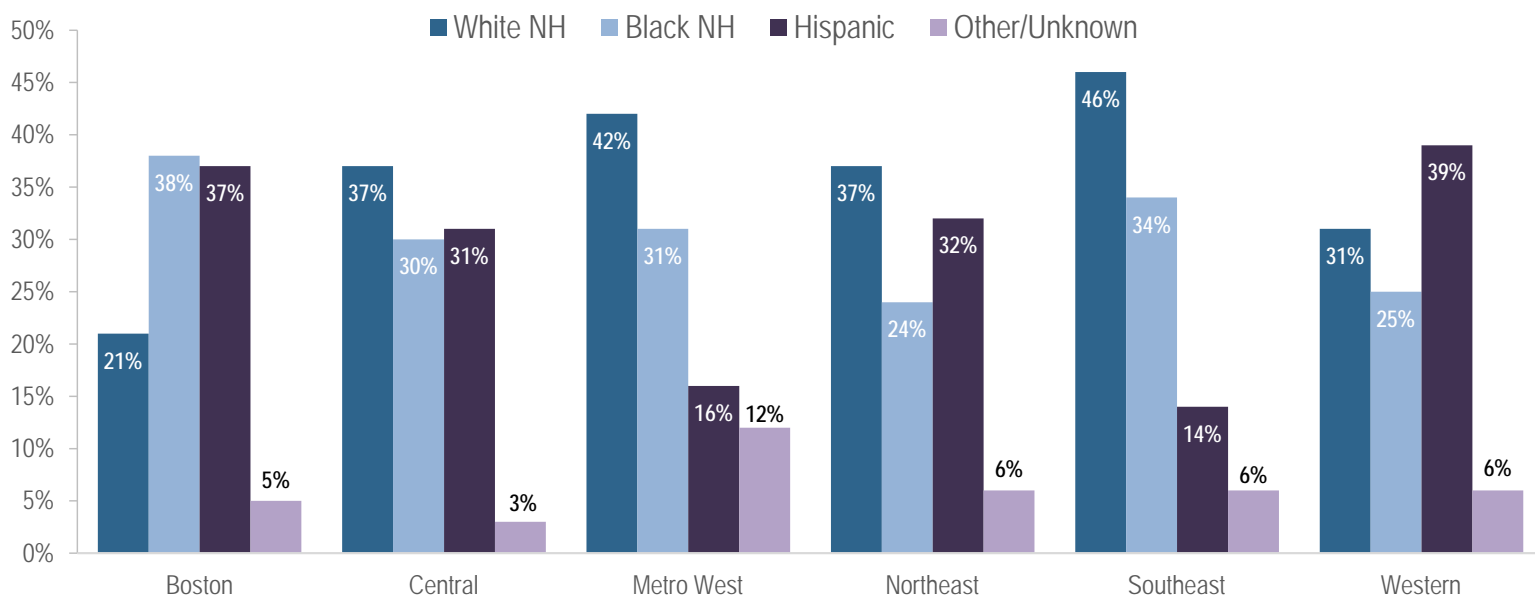
**FIGURE 20.** Percentage distribution of HIV infection diagnoses by Health Service Region (HSR) and exposure mode, Massachusetts 2017–2019 (N=1,819)



MSM was the most frequently reported exposure mode in all regions of Massachusetts for individuals diagnosed with HIV infection during 2017 to 2019, accounting for 49% of diagnoses in the Metro West HSR, 44% in the Boston, Central, and Western HSRs, 36% in the Southeast HSR, and 33% in the Northeast HSR. The Northeast HSR had the highest proportion of individuals with IDU exposure mode at 25%. IDU accounted for 9% to 11% of HIV infection diagnoses in the remaining regions.

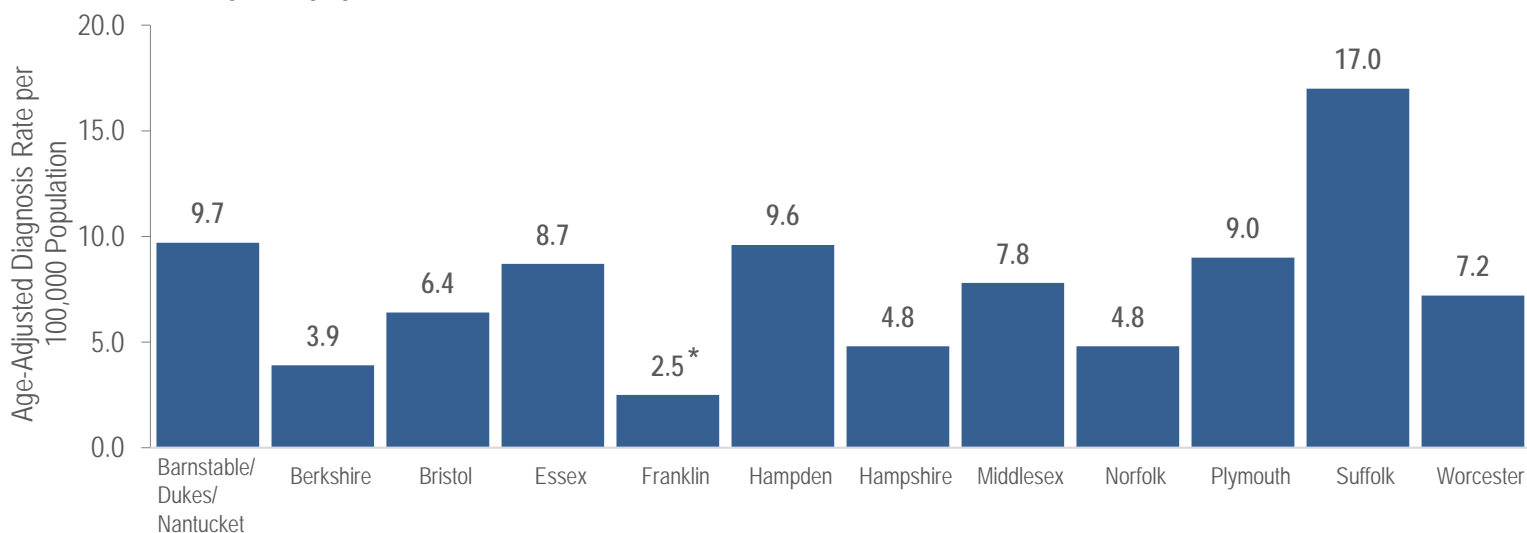
\* HSRs are regions defined geographically to facilitate targeted health service planning. While prisons are not an HSR, the prison population is presented separately in this analysis because of its unique service planning needs. The prisons category represents persons who were diagnosed with HIV infection while in a correctional facility. As these data do not reflect current incarceration status, the category is not included for persons living with HIV infection.

**FIGURE 21.** Percentage distribution of HIV infection diagnoses by Health Service Region (HSR) and race/ethnicity, Massachusetts 2017–2019 (N= 1,819)



The Southeast and Metro West HSRs had the highest proportions of white (non-Hispanic) individuals among individuals recently diagnosed with HIV infection (46% and 42%, respectively). In the Boston HSR, black (non-Hispanic) and Hispanic/Latino individuals accounted for 38% and 37% of recent HIV infection diagnoses, respectively. In the Western HSR, Hispanic/Latino and white (non-Hispanic) individuals accounted for 39% and 31% of recent HIV infection diagnoses, respectively.

**FIGURE 22.** Average age-adjusted annual rate of HIV infection diagnosis per 100,000 population by county, Massachusetts 2017–2019

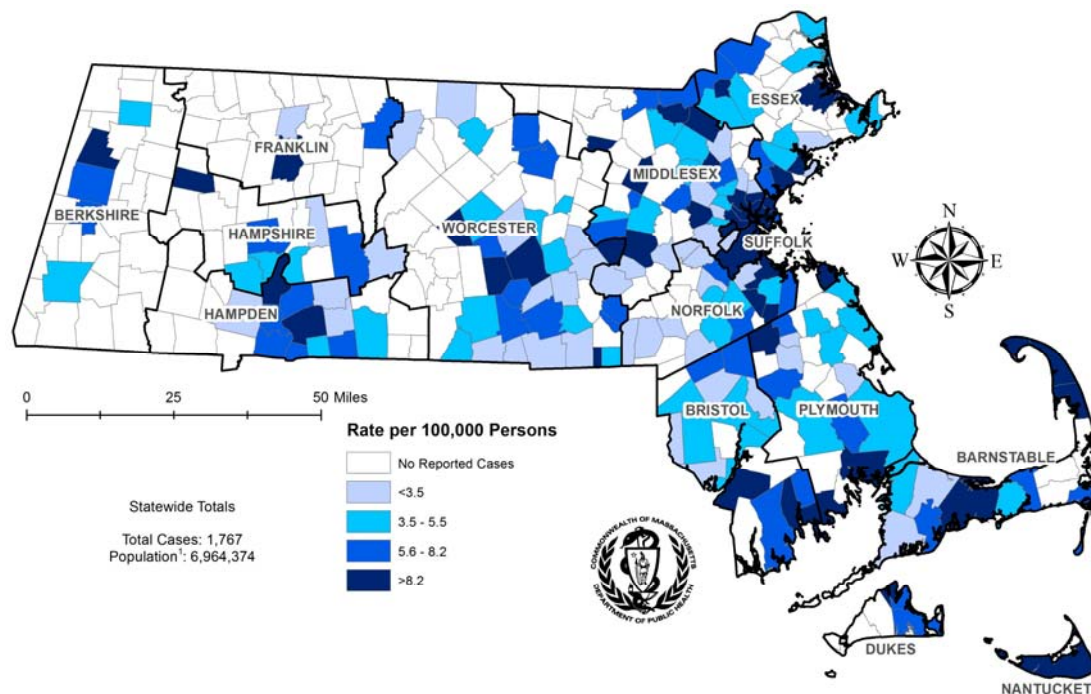


\*Rates based on numerators <12 are marked with an asterisk (\*) and should be interpreted with caution.

Recently, Suffolk County, in which Boston is the biggest city, was selected as one of 48 counties nationally that is prioritized for funding in the U.S. Department of Health and Human Services’ initiative “Ending the HIV Epidemic (EHE): A Plan for America”. This is a ten-year initiative beginning in 2020 to achieve a 75% reduction in new HIV infections in five years and at least a 90% reduction in ten years. For more information about EHE, see <https://www.hrsa.gov/ending-hiv-epidemic>. Suffolk County had the highest average age-adjusted rate of HIV infection diagnosis during 2017 to 2019 among all Massachusetts counties at 17.0 per 100,000, as well as the highest prevalence rate of persons living with HIV infection in 2019 at 797.5 per 100,000.



**FIGURE 23.** Average annual rate of HIV infection diagnosis per 100,000 population\* by city/town, Massachusetts 2017–2019

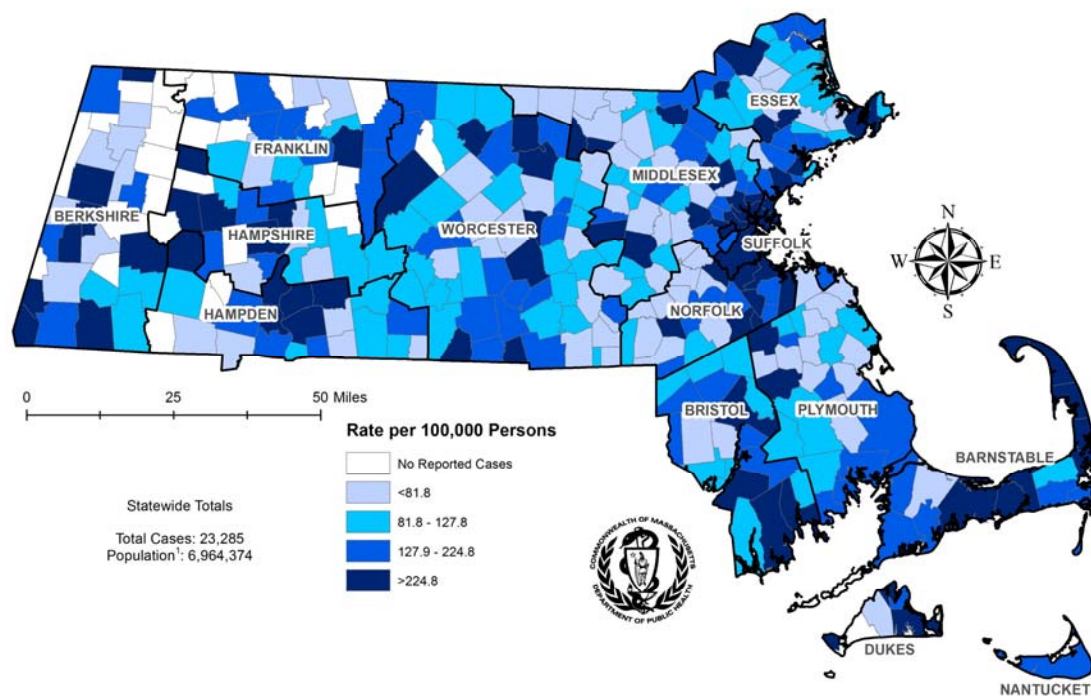


The cities and towns with the highest average annual rate of HIV infection diagnosis during 2017 to 2019 included Provincetown (169.3 per 100,000), Brockton (28.5), Lowell (26.9), Lawrence (23.5), and Everett (21.2).† Boston had the highest number of new HIV infection diagnoses from 2017–2019 (N=396).

Recently, an outbreak of HIV infection was identified in the northeastern cities of Lawrence and Lowell among persons who inject drugs, involving 129 individuals diagnosed with HIV infection during January 2015–May 2018. For more information see:

Charles Alpren et al. “Opioid Use Fueling HIV Transmission in an Urban Setting: An Outbreak of HIV Infection Among People Who Inject Drugs—Massachusetts, 2015–2018”, *American Journal of Public Health* 110, no. 1 (January 1, 2020): pp. 37-44. <https://doi.org/10.2105/AJPH.2019.305366>.

**FIGURE 24.** Prevalence rate of persons living with HIV infection (PLWH) per 100,000 population\* by city/town, Massachusetts 2019



The cities and towns in Massachusetts with the highest prevalence rate of PLWH in 2019 included Provincetown (16,330.7 per 100,000), Springfield (854.1), Boston (845.6), Chelsea (807.6), and Holyoke (763.7).‡ Boston and Springfield had the highest numbers of PLWH in 2019, at 5,796 and 1,335, respectively.

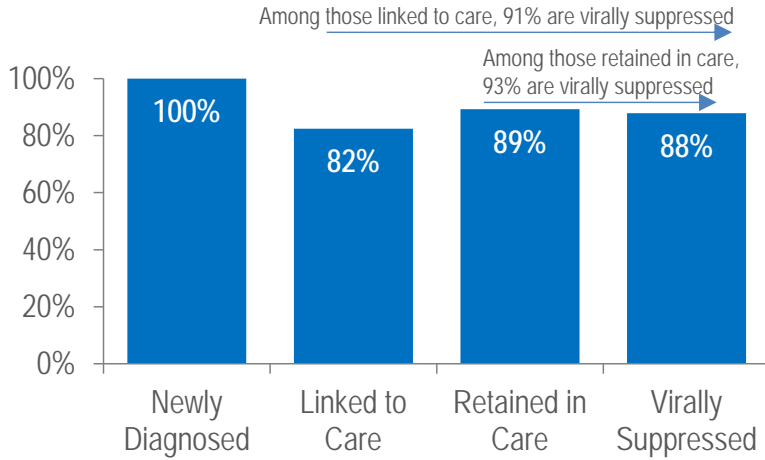
\* As of 1/1/2020, BIDLs calculates rates per 100,000 population using denominators estimated by the University of Massachusetts Donahue Institute using a modified Hamilton-Perry model.

† Among cities that reported at least 12 HIV infections during 2017-2019.

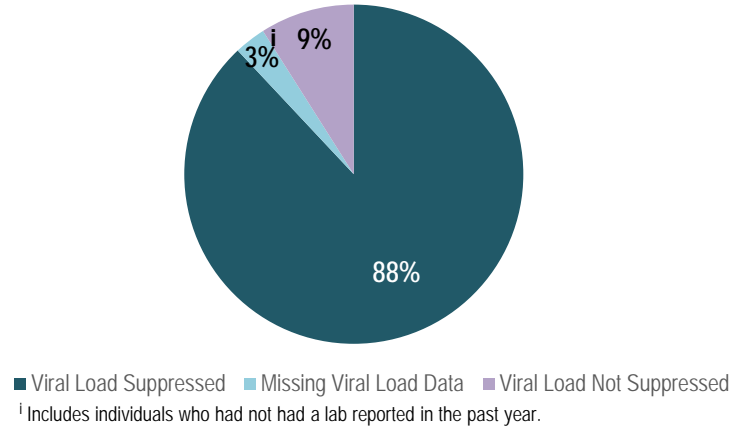
‡ Among cities that reported at least 50 PLWH as of 12/31/2019.

# HIV CARE CONTINUUM

**FIGURE 25.** Stages of HIV care among individuals newly diagnosed with HIV infection in Massachusetts, 2018 (N=661)

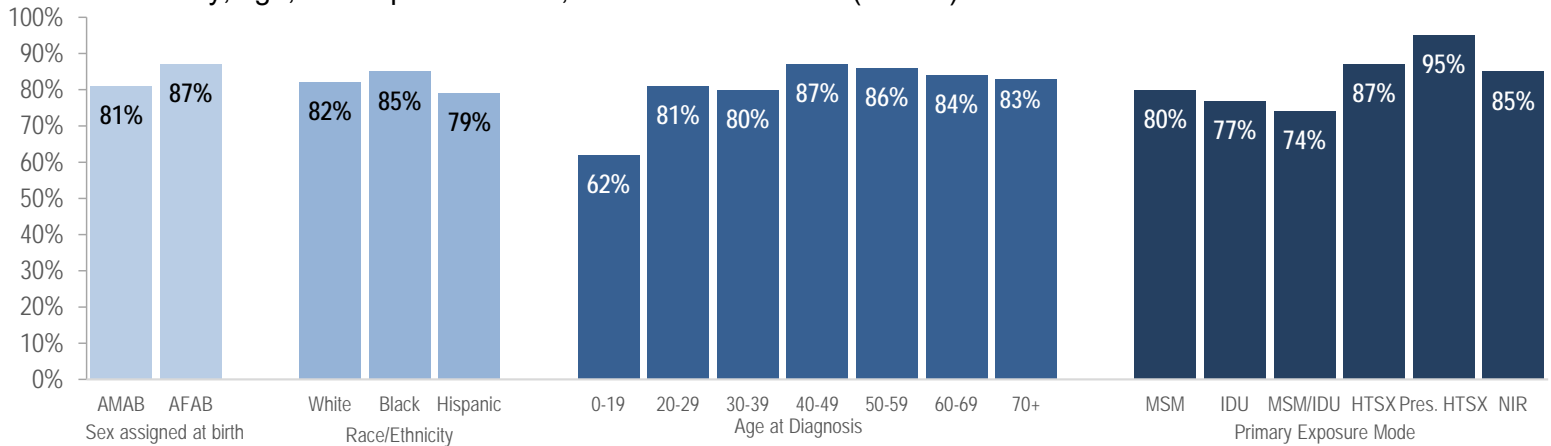


**FIGURE 26.** Viral load status among individuals newly diagnosed with HIV infection in Massachusetts, 2018 (N=661)

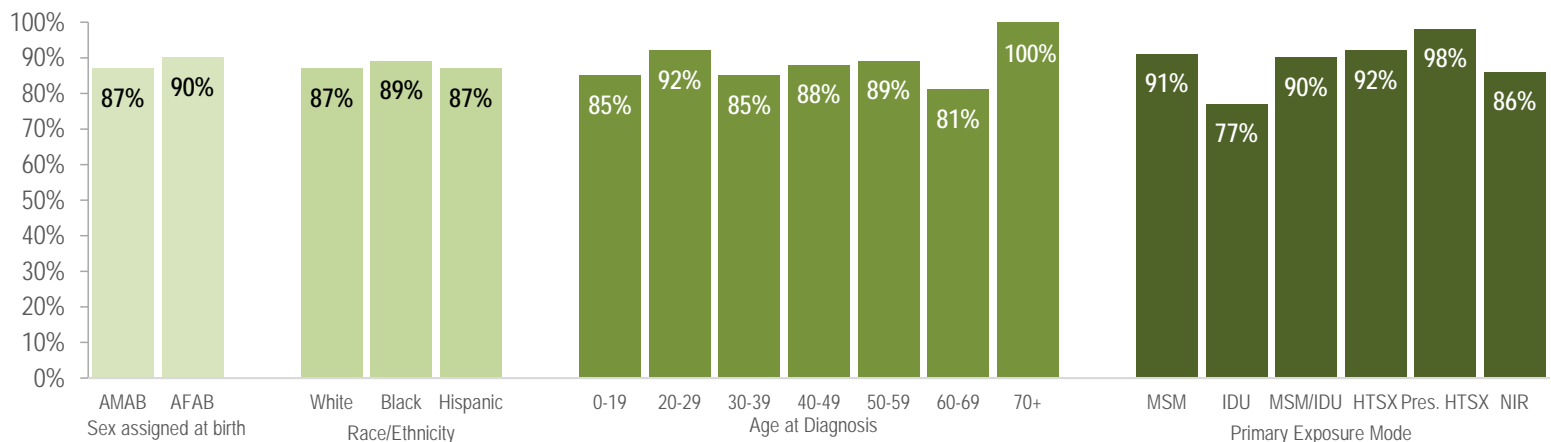


Among 661 individuals newly diagnosed with HIV infection in 2018 (and alive in Massachusetts through 2019), 88% were virally suppressed, 9% were not virally suppressed, and 3% did not have a viral load test in the year after diagnosis. Among those newly diagnosed individuals who were linked to care (N=545) and retained in care (N=590), rates of viral suppression were higher at 91% and 93%, respectively. Among individuals diagnosed with HIV infection in 2018, timely linkage to care differed by age and exposure mode. Viral suppression was lowest among individuals with injection drug use exposure mode.

**FIGURE 27.** Linkage to care among individuals newly diagnosed with HIV infection by sex assigned at birth, race/ethnicity, age, and exposure mode, Massachusetts 2018 (N=661)

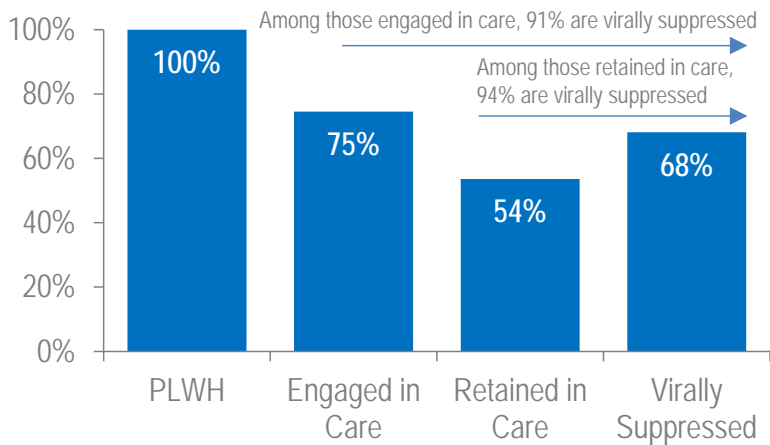


**FIGURE 28.** Viral suppression among individuals newly diagnosed with HIV infection by sex, race/ethnicity, age, and exposure mode, Massachusetts 2018 (N=661)

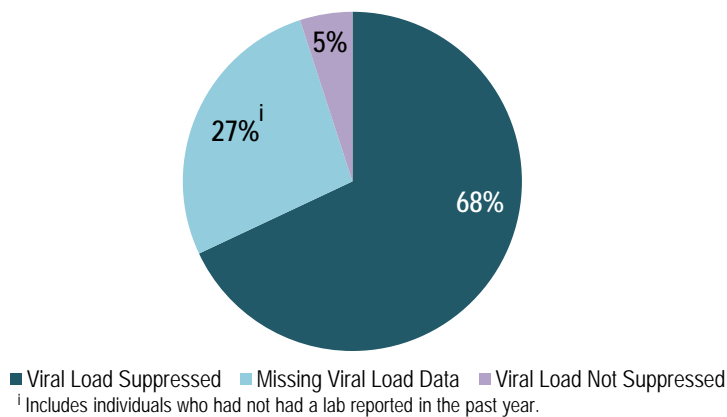




**FIGURE 29.** Stages of HIV care among persons living with HIV infection in Massachusetts, 2019 (N=21,603)

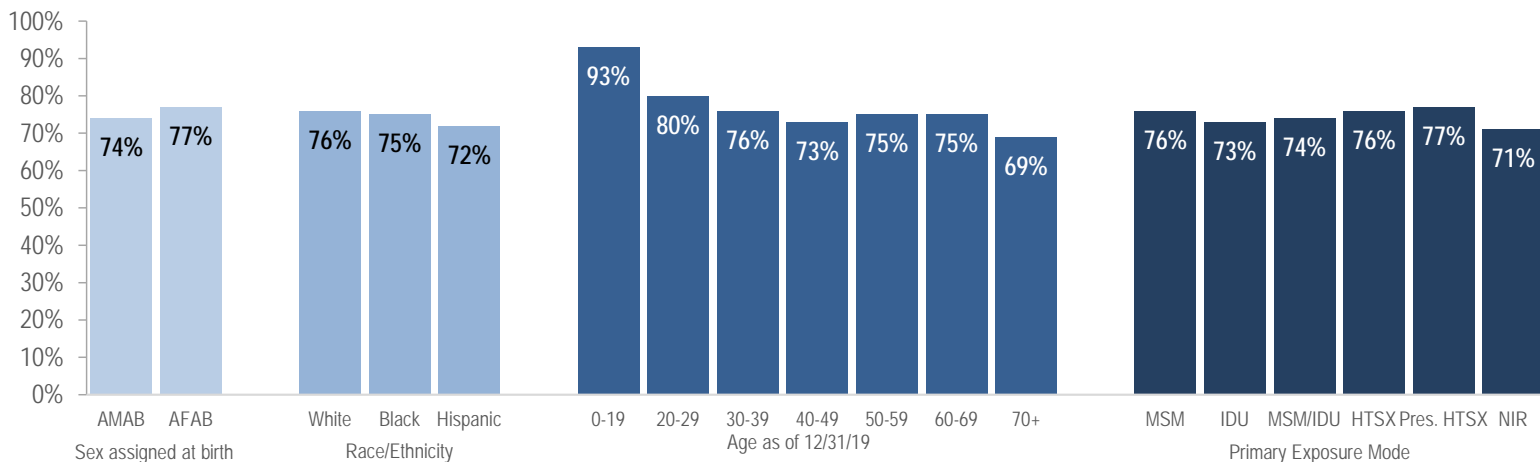


**FIGURE 30.** Viral load status among persons living with HIV infection in Massachusetts, 2019 (N=21,603)

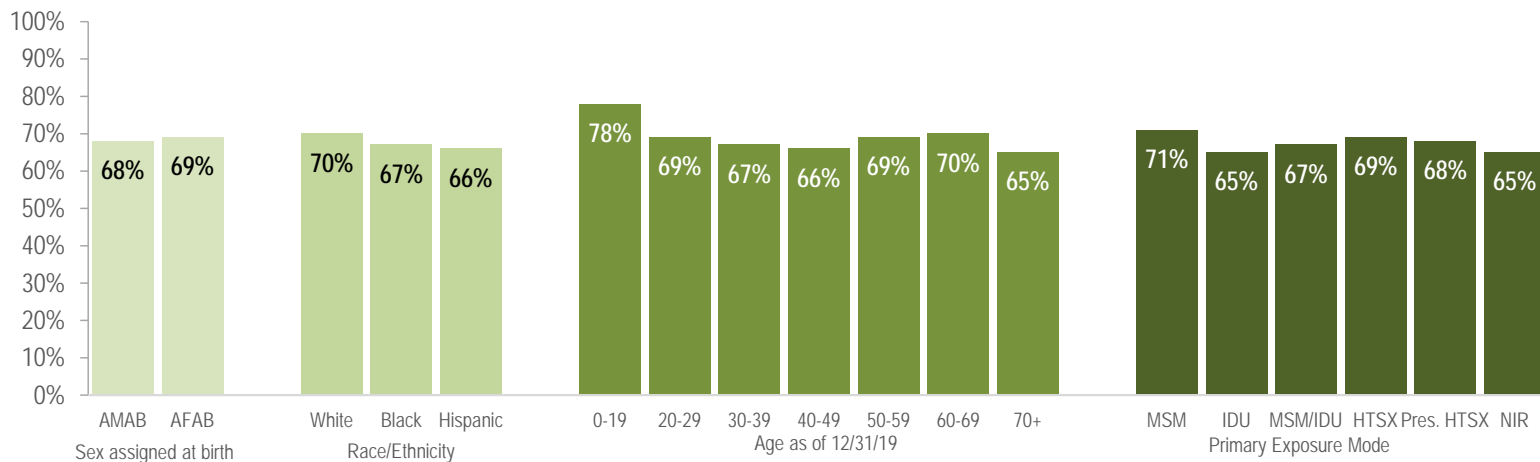


Among 21,603 persons living with HIV infection (PLWH) in Massachusetts at the end of 2019 (and diagnosed through 2018), 68% were virally suppressed, 5% were not virally suppressed, and 27% did not have a viral load test in 2019. Among those PLWH who were engaged in care (N=16,105) and retained in care (N=11,580), rates of viral suppression were higher at 91% and 94%, respectively. In 2019, engagement in care and viral suppression among PLWH differed by age.

**FIGURE 31.** Engagement in care among persons living with HIV infection by sex assigned at birth, race/ethnicity, age, and exposure mode, Massachusetts 2019, (N=21,603)

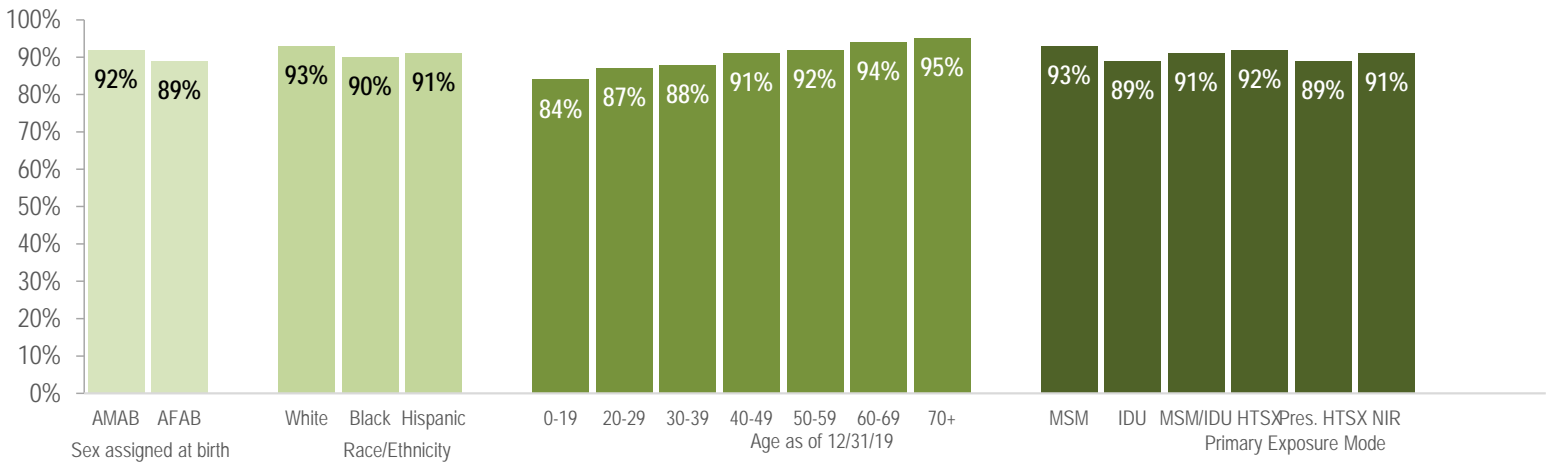


**FIGURE 32.** Viral suppression among persons living with HIV infection by sex assigned at birth, race/ethnicity, age, and exposure mode, Massachusetts 2019 (N=21,603)



For definitions of the care continuum stages, see technical note XI on page 28

**FIGURE 33.** Viral suppression among persons living with HIV infection engaged in care by sex assigned at birth, race/ethnicity, age, and exposure mode, Massachusetts 2019 (N=16,105)



Among 16,105 persons living with HIV infection (PLWH) and engaged in care in Massachusetts at the end of 2019, viral suppression was lowest among individuals aged 0 to 19 years (84% versus 87%-95% for all other age groups). Viral suppression did not differ substantially by sex assigned at birth, race/ethnicity or exposure mode among PLWH engaged in care.

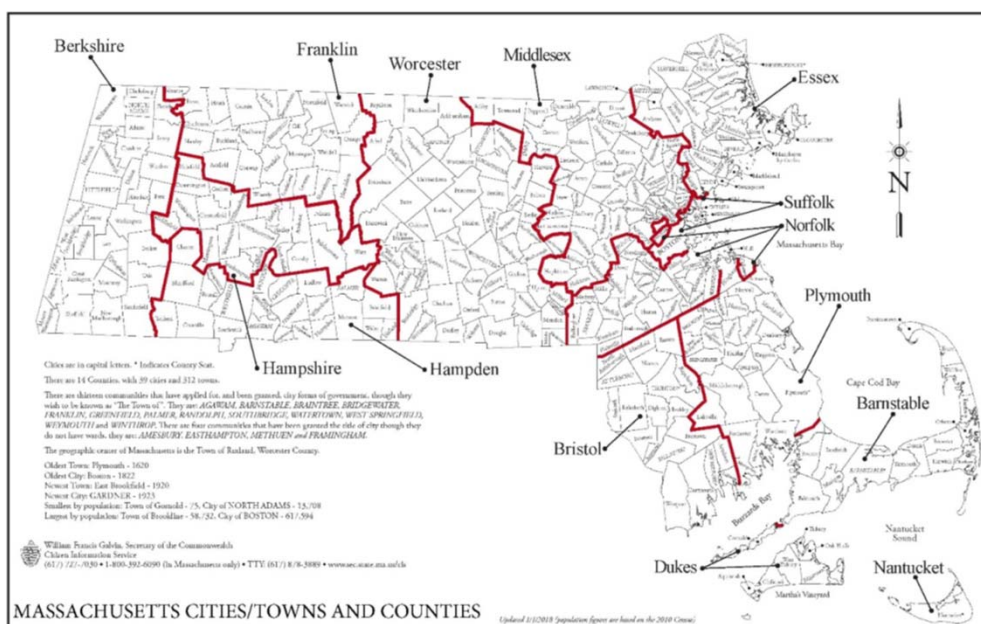
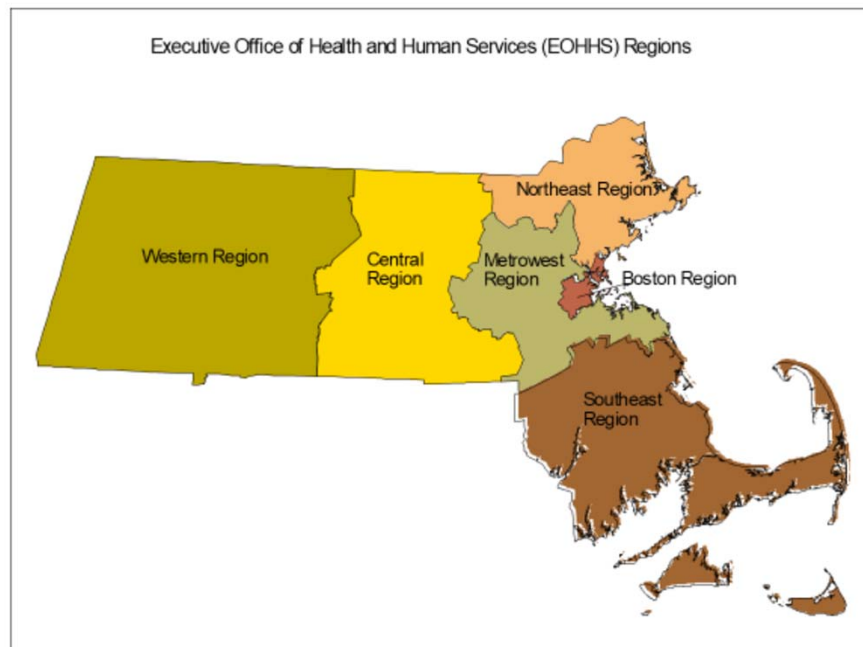
## I. Data source for all HIV/AIDS case data:

Massachusetts Department of Public Health (MDPH) Bureau of Infectious Disease and Laboratory Sciences (BIDLS) HIV/AIDS Surveillance Program, data are current as of 2/1/2021 and may be subject to change.

## II. Individuals living with HIV infection by current residence:

As of January 1, 2018, the MDPH BIDLS HIV/AIDS fact sheets, epidemiologic reports, and other HIV data presentations include all persons living with HIV infection (PLWH) who are currently residing in Massachusetts. These prevalent cases include those who may have been first diagnosed in another state. Reports of incidence or new HIV infection diagnoses will continue to include only individuals who are first diagnosed in Massachusetts. Please note that HIV/AIDS fact sheets, data reports, and presentations published from 2011 to 2017 include only cases that were first diagnosed in Massachusetts. BIDLS service planning continues to ensure responsive services to the entire population living with HIV infection in Massachusetts, regardless of place of diagnosis.

## III. Configuration of Health Service Regions (HSR), Cities/Towns, and Counties



#### **IV. Background on HIV reporting system**

Massachusetts Department of Public Health (MDPH) regulations started requiring healthcare providers to submit case report forms, with demographic and risk information, on individuals diagnosed with AIDS in 1983, and with HIV infection in 1999. Existing cases of HIV infection diagnosed through 1998 were also to be reported by the end of 1999. When comparing HIV infection diagnosed before 1999 to HIV infection diagnosed after 1999, users should consider the differences in HIV reporting requirements for these two time periods. Since HIV was not reported at diagnosis prior to 1999 and clinical providers were given a relatively short time frame within which to report all prevalent HIV cases, the pre-1999 data may be less complete than data reported after 1999. Additionally, pre-1999 HIV infection diagnoses do not include individuals who were diagnosed with HIV infection and who died before 1999 without being reported with AIDS, nor do they include individuals who were no longer receiving HIV-related health care in Massachusetts at the point when HIV (non-AIDS) reporting became mandatory.

Beginning in 2019, all new diagnoses of HIV infection were assigned to field epidemiologists for partner services, to ensure disease education/comprehension, and assist with linkage to HIV care. As a part of this process, field epidemiologists helped to collect pertinent epidemiological, demographic, and risk information of the individual.

#### **V. Data limitations**

While trends in new HIV infection diagnoses are the best indicator of those who are most at risk of HIV infection, HIV surveillance reflects only incident diagnoses among individuals who are in care and not the actual incidence of new infections. Individuals may be living with HIV infection for many years prior to being tested and seeking care, at which point the case is considered a “diagnosis” and reported to the MDPH Bureau of Infectious Disease and Laboratory Sciences. In the most recent years of data presented, delays may occur in the reporting of a case to MDPH after it is diagnosed. Although Massachusetts regulations require providers to submit HIV case reports in a timely fashion, some 2019 HIV infection diagnoses will be reported to the surveillance program after the release of this report. Thus, the 2019 data presented in this report may change slightly. Previous analyses of Massachusetts HIV/AIDS case data have suggested that the distribution of HIV infection diagnoses by race/ethnicity, sex assigned at birth and exposure mode for cases reported more than 6 months after diagnosis was not substantially different than the distribution of HIV infection diagnoses reported within 6 months. Caution should be exercised when considering changes in HIV infection diagnosis trends for 2019.

#### **VI. Deaths among individuals reported with HIV/AIDS**

The death data presented in this report include all deaths among individuals diagnosed and reported with HIV/AIDS in Massachusetts to present a full description of trends in mortality among this population. This includes deaths from non-HIV/AIDS related causes such as drug overdoses, suicides, motor vehicle accidents and other causes. Therefore, the total number of annual deaths reported here will vary from the number of HIV/AIDS-related deaths reported in *Massachusetts Deaths* by the Massachusetts Department of Public Health, Office of Population Health (available at <https://www.mass.gov/lists/death-data>). The death data reported here are considered complete through 2019. Data on deaths occurring in Massachusetts are from matches with the Massachusetts Registry of Vital Records and Statistics and from provider reports. Data on deaths occurring outside of Massachusetts are from matches with the Social Security Death Master File.

## VII. HIV primary exposure mode definitions

The HIV/AIDS primary exposure mode indicates the most probable risk behavior associated with HIV infection. Assignment of primary exposure mode is done in accordance with Centers for Disease Control and Prevention (CDC) guidelines when multiple exposure modes are reported. Although the reported primary exposure mode is the most likely mode of transmission, there is always the possibility that it is not the actual mode of transmission. Following is a description of the exposure mode categories:

- **MSM (Male-to-Male Sex):** Includes all individuals assigned male at birth who report any sexual contact with other individuals that identify as male. Please note that in accordance with CDC guidelines, this category is defined by an individual's assigned sex at birth and not an individual's current gender identity.
  - **Sex with Men:** This exposure mode category is used by the Bureau of Infectious Disease and Laboratory Sciences (BIDLS) to categorize sexual risk in transgender women reporting sex with men only. For the purposes of official reporting in the MA HIV/AIDS Surveillance System and to CDC, exposure mode for transgender women is based on sex assigned at birth, and therefore would be reported as male-to-male sex.
- **IDU (Injection Drug Use):** Cases among persons who report injection drug use.
- **MSM/IDU:** Includes all individuals assigned male at birth who report both sexual contact with other individuals that identify as male and injection drug use.
  - **Sex with Men/IDU:** This exposure mode category is used by BIDLS to categorize sexual risk in transgender women reporting both sex with men and injection drug use. For the purposes of official reporting in the MA HIV/AIDS Surveillance System and to CDC, exposure mode for transgender women is based on sex assigned at birth, and therefore would be reported as MSM/IDU.
- **Heterosexual Sex:** Cases among persons who report heterosexual sex with a person with, or at increased risk for, HIV infection (e.g., a PWID). The sub-categories for this mode of transmission are listed below.
  - Heterosexual Sex w/ a person who injects drugs
  - Heterosexual Sex w/ a person w/ HIV infection or AIDS
  - Heterosexual Sex w/ bisexual male
  - Other Heterosexual Sex: includes all other sub-categories of heterosexual risk, such as heterosexual contact with a person infected through a blood transfusion.
- **Other:** Cases among persons with other known exposure modes, including receipt of clotting factor, receipt of transfusion or transplant, and mother-to-child transmission through pregnancy, childbirth, or breastfeeding (perinatal transmission).
- **Presumed Heterosexual:** The presumed heterosexual risk category is used by BIDLS exclusively for individuals assigned female at birth to identify HIV exposure mode when sex with individuals that identify as male was the only reported risk factor, there was no evidence of current or past injection drug use (IDU), and behavioral risk and HIV status information about sexual partners that identify as male was unknown. The rationale for the application of the presumed heterosexual risk category to individuals assigned female at birth only has been addressed in the MDPH Office of HIV/AIDS report "Intersecting Risks: HIV Infection among Heterosexual Women and Men in Massachusetts" (2010).
- **NIR (No Identified Risk):** Cases among persons with no reported history of exposure to HIV through any of the listed exposure categories. Follow-up is conducted to determine risk for those cases that are initially reported without a risk identified. Includes cases among individuals assigned male at birth who were previously categorized in Massachusetts as Presumed Heterosexual.

### **VIII. Cell suppression methodology:**

Values less than five are suppressed for denominator populations less than 50,000 or for unknown size. Additional values may be suppressed to prevent back calculation. Values less than five are not suppressed for compound categories (categories containing two or more subcategories, such as other/undetermined or other exposure modes, which includes pediatric, blood, and blood products exposure modes), because the exact population value of each subcategory cannot be determined.

### **IX. Population estimates used for rate calculations**

As of 1/1/2020, BIDLS calculates rates per 100,000 population using denominators estimated by the University of Massachusetts Donahue Institute using a modified Hamilton-Perry model. 2019 population estimates were used for single-year rates; for pooled year rates (i.e., 2017-2019), the 2019 population estimates were multiplied by three. For more information, see: Strate S, et al. Small Area Population Estimates for 2011 through 2020, report published Oct 2016, and <http://www.donahue.umassp.edu/business-groups/economic-public-policy-research/massachusetts-population-estimates-program>. Note that rates and trends calculated using previous methods cannot be compared to these and that the prior edition of the HIV/AIDS Epidemiologic Profile used two sources of population estimates to calculate rates of HIV infection diagnosis, AIDS diagnosis, HIV prevalence and deaths among individuals with HIV/AIDS: Vintage 2017 Bridged-Race Postcensal Estimates were used for statewide rates and American Community Survey 5-Year Estimates were used for city/town, county, and HSR rates.

### **X. Explanation of age-adjusted rates**

A rate of a disease per 100,000 population is a useful way to compare groups with substantially different population sizes rather than relying on the raw number of cases. For example, the number of individuals living with HIV infection on December 31, 2019 who are Hispanic/Latino was 6,213, whereas the number of individuals living with HIV infection who are white (non-Hispanic) was 9,308. Although the *number* of individuals living with HIV infection who are Hispanic/Latino in Massachusetts is smaller than the number of individuals living with HIV infection who are white (non-Hispanic), we also need to consider that there are far fewer individuals of Hispanic/Latino heritage living in Massachusetts than white (non-Hispanic) individuals. Hispanic/Latino individuals represent 12% of the Massachusetts population compared to white (non-Hispanic) individuals who represent 71% of the population. If HIV/AIDS had the same impact on the Hispanic/Latino population of the state as on the white (non-Hispanic) population, then there should be six times as many cases in white (non-Hispanic) individuals, but there are less than twice as many. By calculating a rate which takes into consideration the differences in the population size, it is evident that the number of individuals living with HIV infection for every 100,000 Hispanic/Latino individuals in Massachusetts is much higher than the rate for every 100,000 white (non-Hispanic) individuals. This is called a crude rate and is calculated by dividing the number of individuals living with HIV infection by the population of interest (the total number of Hispanic/Latino individuals in Massachusetts, for example) and multiplying by 100,000. (See example below.)

Example: Calculation of crude HIV/AIDS prevalence rate for white (non-Hispanic) individuals, Massachusetts (187.8 per 100,000)

$$\begin{aligned} \text{Crude HIV/AIDS prevalence rate for white (non-Hispanic) individuals} &= [\text{number of white (non-Hispanic) individuals living with HIV infection} \div \text{population size of white (non-Hispanic) individuals}] \times 100,000 \\ &= (9,308/4,956,032) \times 100,000 \\ &= (0.00187812) \times 100,000 \\ &= 187.8 \end{aligned}$$

However, sometimes, in addition to the population size being different, the age composition of the populations is different. In Massachusetts, the black (non-Hispanic) and Hispanic/Latino populations are on average younger than white (non-Hispanic) population (medians: 29.7 years and 24.5 years vs. 38.8 years, respectively). Therefore, it is necessary to age-adjust the HIV/AIDS prevalence rate to get a true comparison of the impact of the disease across racial/ethnic groups without an effect from the differences in age composition. Age-adjustment of rates minimizes the distortion created by differences in age composition. Age-adjusted rates are calculated by weighting the age-specific rates for a given population by the age distribution of a standard population. The weighted age-specific rates are then summed to produce the adjusted rate for all ages combined.

#### **XI. HIV Care Continuum Indicator Definitions:**

- HIV care continuum among individuals newly diagnosed with HIV infection in Massachusetts: “Newly Diagnosed” includes individuals diagnosed in 2018, alive through 12/31/2019, and living in Massachusetts based on last known address. “Linked to Care” is defined as having  $\geq 1$  viral load (VL) or CD4 test result within 3 months of diagnosis. “Retained in Care” is defined as having  $\geq 2$  VL or CD4 test results at least 3 months apart during the 12-month period after diagnosis. “Virally Suppressed” is defined as having a VL  $\leq 200$  copies/mL for the most recent VL test drawn during the 12-month period after diagnosis.
- HIV care continuum among persons living with HIV infection (PLWH) in Massachusetts: “PLWH” refers to individuals diagnosed through 2018, alive through 12/31/2019, and living in Massachusetts based on last known address. “Engaged in Care” is defined as having  $\geq 1$  VL or CD4 test result in 2019. “Retained in Care” is defined as having  $\geq 2$  VL or CD4 test results at least 3 months apart in 2019. “Virally Suppressed” is defined as having a VL  $\leq 200$  copies/mL for the most recent VL test drawn in 2019.