

# Opioid-Related Acute Hospital Utilization in Massachusetts

# Table of Contents

<b>I.</b>	<b>Executive Summary</b> .....	<b>3</b>
<b>II.</b>	<b>Guide to this Chartpack</b> .....	<b>4</b>
<b>III.</b>	<b>Key Findings</b> .....	<b>5</b>
<b>IV.</b>	<b>Opioid Use Disorder Mortality and Acute Care Hospital Utilization</b> .....	<b>6-25</b>
	a) Opioid-related mortality per 100,000 people, 1999-2017, Massachusetts and the U.S. ....	6
	b) Opioid-related acute care hospital ED and inpatient utilization, 2010-2017.....	7
	c) Opioid-related hospital utilization by state, 2016.....	8
	d) Opioid-related acute care hospital ED utilization, 2010-2017.....	9
	e) Opioid-related acute care hospital inpatient utilization, 2010-2017.....	10
	f) Primary diagnoses for discharges with secondary opioid-related diagnoses, 2017.....	11
	g) Opioid-related ED visits, percent of patients by number of visits, 2017.....	12
	h) Opioid-related ED discharges by HPC regions of patients' residence, 2012 and 2017.....	13
	i) Opioid-related ED discharges by primary care service area of patient residence, 2012 and 2017.....	14
	j) Change in opioid-related ED discharges, 2016-2017.....	15
	k) Opioid-related ED discharges, top 15 hospitals, 2016-2017.....	16
	l) Opioid-related hospital inpatient discharges, top 15, 2016 – 2017.....	17
	m) Opioid-related hospital discharges by sex, 2017 .....	18
	n) Opioid-related hospital discharge rates per 100,000 by community income quartile, 2012, 2016, and 2017.....	19
	o) Opioid-related hospital discharge rates per 100,000 by age group, 2016 and 2017.....	20
	p) Opioid-related hospital discharge rates per 100,000 by age group, 2012 and 2017.....	21
	q) Opioid-related hospital discharges by primary payer, 2017.....	22
	r) Opioid-related hospital discharge rates per 100,000 by race and ethnicity, 2012, 2016, and 2017 .....	23
	s) Opioid-related hospital discharge rates per 100,000 by race, ethnicity, and sex, 2012, 2016, and 2017 .....	24
	t) Opioid-related overdose death rates per 100,000 by race, ethnicity, and sex, 2016 and 2017 .....	25
<b>V.</b>	<b>Neonatal Abstinence Syndrome (NAS) and Substance Exposed Newborns (SEN)</b> .....	<b>26-28</b>
	a) Number of infants diagnosed with NAS or substance exposure related to opioid use, 2010-2017.....	26
	b) NAS/SEN births by HPC region of patients' residence and rates per 1,000 live births, 2017.....	27
	c) NAS/SEN discharges and rate per 1,000 births at highest rate hospitals, 2017.....	28
<b>VI.</b>	<b>Conclusion</b> .....	<b>29</b>
<b>VII.</b>	<b>Methodology</b> .....	<b>30</b>

# Executive Summary

While Massachusetts continues to experience high rates of opioid-related injury and death, recent evidence suggests that the impact of the opioid epidemic is moderating. According to the latest [quarterly data](#) released from the Massachusetts Department of Public Health (DPH), the opioid-related overdose death rate in Massachusetts declined from 2016 to 2018, falling an estimated four percent.

To complement the surveillance work conducted by DPH, and to provide further data-driven insights into the changing nature of the opioid epidemic, the **Massachusetts Health Policy Commission (HPC)** regularly reports on the impact of opioid use on acute care hospital utilization in the Commonwealth. This chartpack builds on [previous reports](#) conducted by the HPC, and includes new analyses based on the most recent data from through 2017. The chartpack also includes updated data on the number of infants born with neonatal abstinence syndrome (NAS), a diagnosis that is growing in prevalence due to the increased rate of in utero exposure to opioids, and of substance exposed newborns.

The HPC analysis shows that after several consecutive years of substantial double-digit annual increases, the statewide rate of opioid-related hospital utilization in Massachusetts declined slightly (-2.3 percent) between 2016 and 2017. This is the first decline observed since the HPC began tracking these rates in 2010.

The overall rate, however, remained high compared to other states. Further, not all subpopulations within Massachusetts experienced a reduction, and opioid-related hospital use remained highly variable by patient age, income, sex, race/ethnicity, and geographic region. For example, the rate of opioid-related hospital use moderated for younger adults in 2017, but continued to increase among those identified in the data as Black/African American, and older age groups.

The findings presented here indicate some recent progress in stabilizing the statewide rate of opioid-related hospital use, but significant challenges endure for many patients and communities. The HPC remains committed to working collaboratively with other public and private stakeholders to address persistent disparities and improve the health care system's ability to care for all individuals with opioid use disorder in the most appropriate setting.

# Guide to this Chartpack

This chartpack includes the HPC's analysis of opioid-related discharges in acute hospital emergency department (ED) and inpatient settings, as well as opioid-related mortality data from the Centers for Disease Control and Prevention (CDC) and the Massachusetts DPH.

In the analysis of discharge data, opioid-related acute hospital discharges refers to both inpatient discharges and ED discharges with any opioid-related diagnosis (primary or secondary admission or discharge diagnoses). Some charts display discharges with primary or secondary diagnoses separately; some also show analysis of inpatient and ED discharges separately.

Geographic analysis is based only on ED discharges because acute inpatient facilities' use for opioid-related disorders in a given geographic area depends upon the number of specialty substance use facilities in that area, while this factor does not skew ED use.

This chartpack also includes analysis of infants born with NAS and of substance exposed newborns. This analysis combines those two diagnoses and reports rates per 1,000 live births.

## Sources

- The analyses in this chartpack exclude data from specialty hospitals and facilities to which patients are most often admitted for withdrawal management services. Therefore, the analyses represent the impact of opioid use on the acute care hospital system, not the full range of opioid-related inpatient utilization among Massachusetts residents.
- Analyses involve data from different years from 2010 to 2017; slide titles indicate the relevant years for the given analyses.

## Maps

- Some maps use the 15 HPC-designated regions as the level of analysis. These regions are based on patterns of patient travel for inpatient care. For more information on how the HPC created these regions, please see: <http://www.mass.gov/anf/docs/hpc/2013-cost-trends-report-technical-appendix-b3-regions-of-massachusetts.pdf>.
- Other maps use primary care service areas, determined by the Human Resources and Services Administration, which provide information about primary care and populations within small, standardized areas that reflect patient utilization patterns.

## Diagnoses and Coding

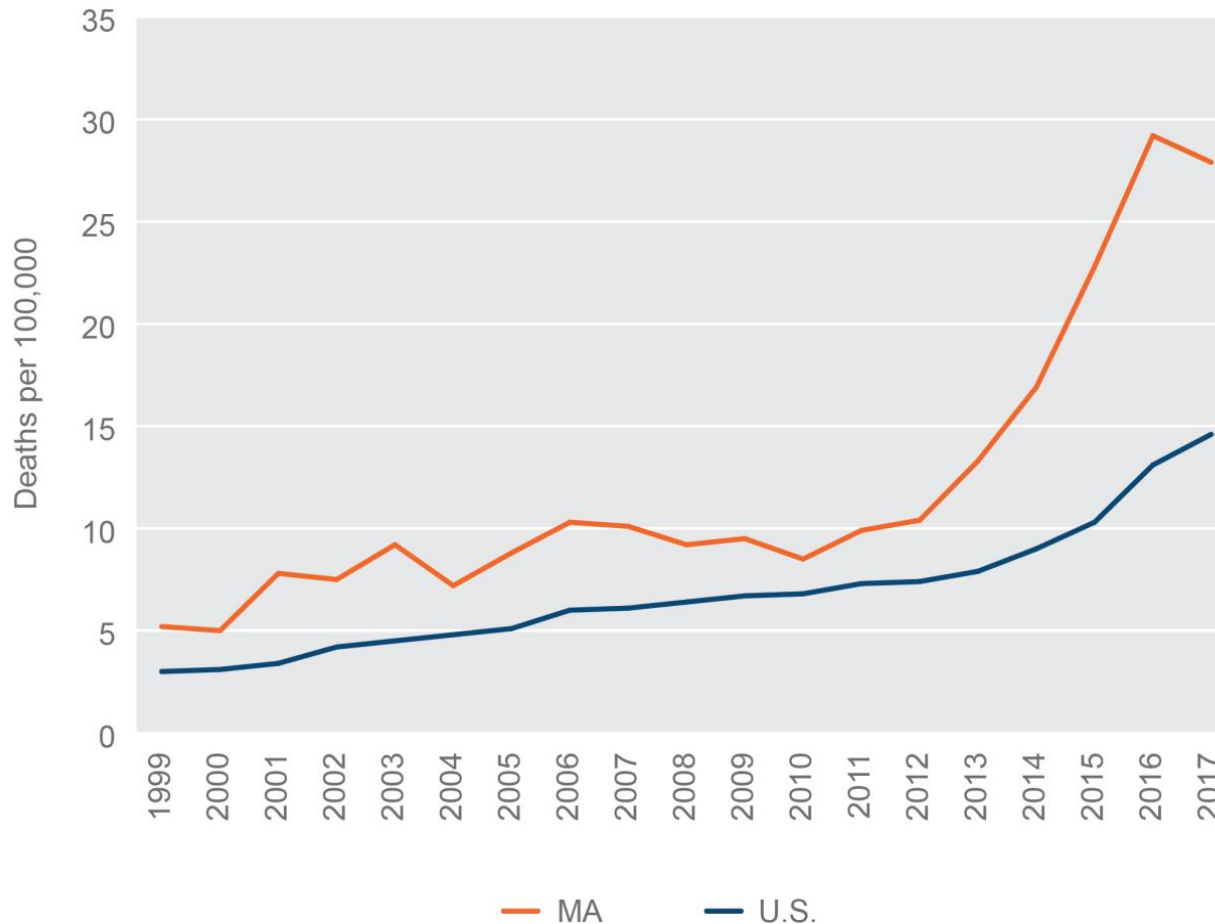
- In 2016, ICD-9 codes were updated to ICD-10 codes. After this transition, there was an increase in the number of infants coded with a substance exposure diagnosis and slightly fewer coded with NAS. These changes also impacted codes used for opioid-related disorders. See Methodology slide (slide 30) for a list of codes included as opioid-related, as well as other detail on coding changes in the discharge database.

# Key Findings

- From 2016 to 2017, the death rate from opioid overdoses declined by 3% [according to DPH data](#), and opioid-related hospital discharges (both ED and inpatient) fell by 2.3% - the first decline observed since the HPC began tracking these rates in 2010.
- Opioid-related hospital discharges increased by 20% from 2014 to 2015 and by 17% from 2015 to 2016, before falling slightly from 2016 to 2017.
- Most patients who were discharged from an ED with an opioid-related diagnosis in 2017 had only one such visit during the year. Yet patients with multiple visits accounted for more than half of all opioid-related ED visits.
- Opioid-related ED use remains highly variable by region, with Fall River and Metro South having the highest rates, roughly three times that of Metro West.
- Residents with opioid-related hospital discharges are disproportionately lower-income, on public insurance, and between the ages of 25 and 40.
- From 2016 to 2017, the opioid-related hospital discharge rate declined in the under-35 population, particularly in the 20-25 age group (24% decrease), but grew among older adults.
- Across all individuals with race identifiers available in the data, the rate of opioid-related discharges increased by more than 50% between 2012 and 2017; the rate among those identified as Black/African American increased by 98%. From 2016 to 2017, while the rate fell among those identified as White and Hispanic, it rose by more than 5% among those identified as Black/African American.
- In 2012, the rate of opioid-related discharges was 2.7 times higher for patients living in lower-income areas of the state than in higher-income areas. Those differences diverged further between 2012 and 2017, as discharges of patients living in in areas in the lowest income quartile increased twice as fast as they did in areas in the highest income quartile. By 2017, 40% of discharges were for patients living in the lowest income quartile areas.
- From 2016 to 2017, the rate of NAS or substance exposure in newborns decreased 6%, mirroring the decrease in both opioid-related mortality and hospitalizations over the same time period.

# Opioid-related mortality per 100,000 people, 1999-2017, Massachusetts and the U.S.

## Mortality



From 2010 to 2016, the opioid-related mortality rate in Massachusetts increased more rapidly than the national average. There was particularly sharp growth in the Massachusetts mortality rate between 2014 and 2016 – an increase of 12 deaths per 100,000 people. In comparison, the national average mortality rate increased by 4 deaths per 100,000 people during that time.

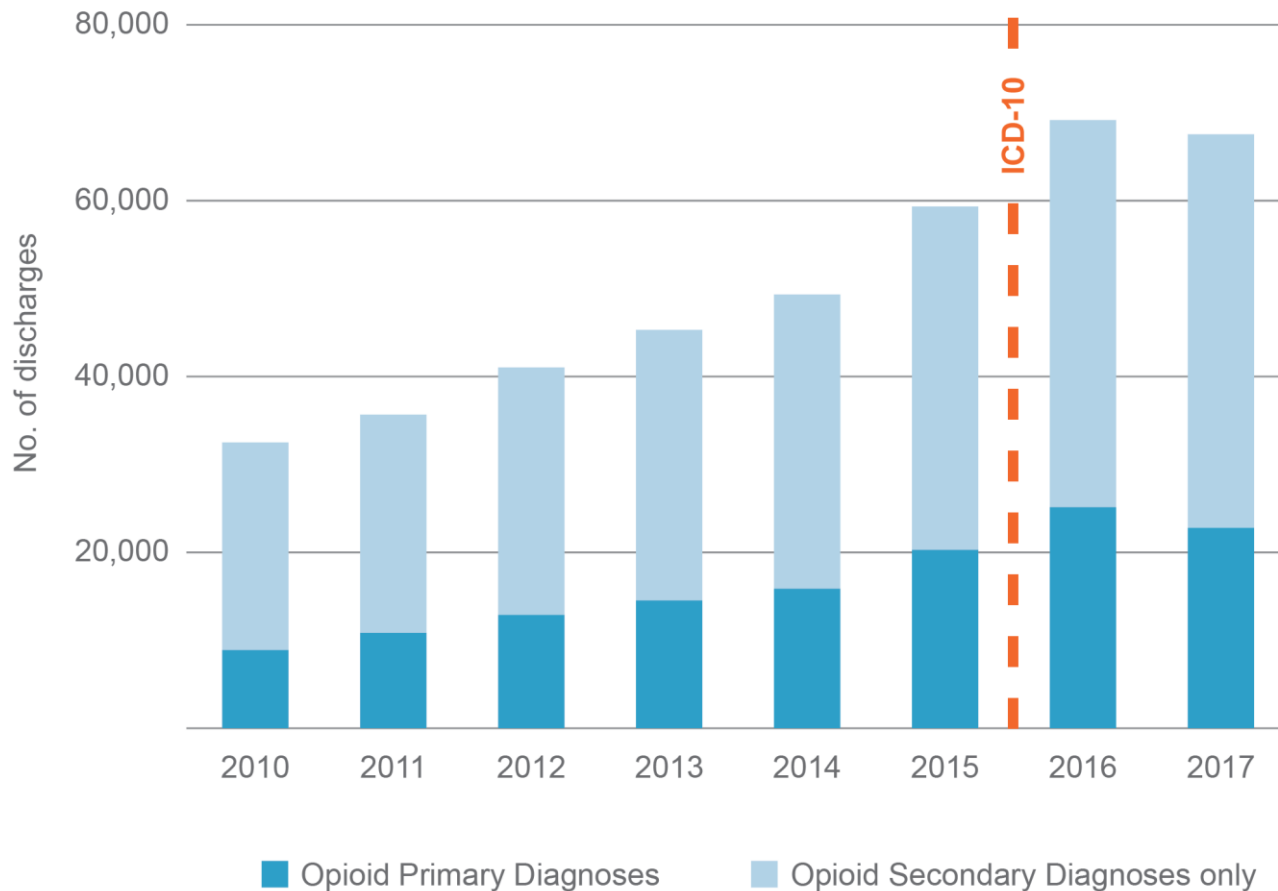
Between 2016 and 2017, however, the opioid-related mortality rate in Massachusetts diverged from national trends and, [according to DPH data](#), declined by 3%, a reduction of one death per 100,000 people. The national opioid-related mortality rate climbed 11% during that time.

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple Cause of Death 1999-2017 on CDC WONDER Online Database, released December, 2018. Data are from the Multiple Cause of Death Files, 1999-2017, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at <http://wonder.cdc.gov/mcd-icd10.html> on Mar 22, 2019 1:24:36 PM

Note: Poisonings were identified using Universal Data collection (UDC) drug related causes (ICD-10 codes X40-44, X60-64, X85, Y10-Y14) and ICD-10 codes T40.0 – T40.4 and T40.6, which account for opium, heroin, methadone, other opioids, other synthetic opioids, and other and unspecified narcotics. The rate displayed is the crude rate, not the age adjusted rate. Dates are based on the calendar year.

# Opioid-related acute care hospital ED and inpatient utilization, 2010-2017

## ED and Inpatient



Since 2010, opioid-related acute hospital discharges (both ED and inpatient) have grown substantially in Massachusetts, accelerating to 20% growth between 2014 and 2015, followed by 16.6% growth between 2015 and 2016. From 2016 to 2017, the rate declined by 2.3%. This overall decline was driven by a reduction in opioid-related ED discharges.

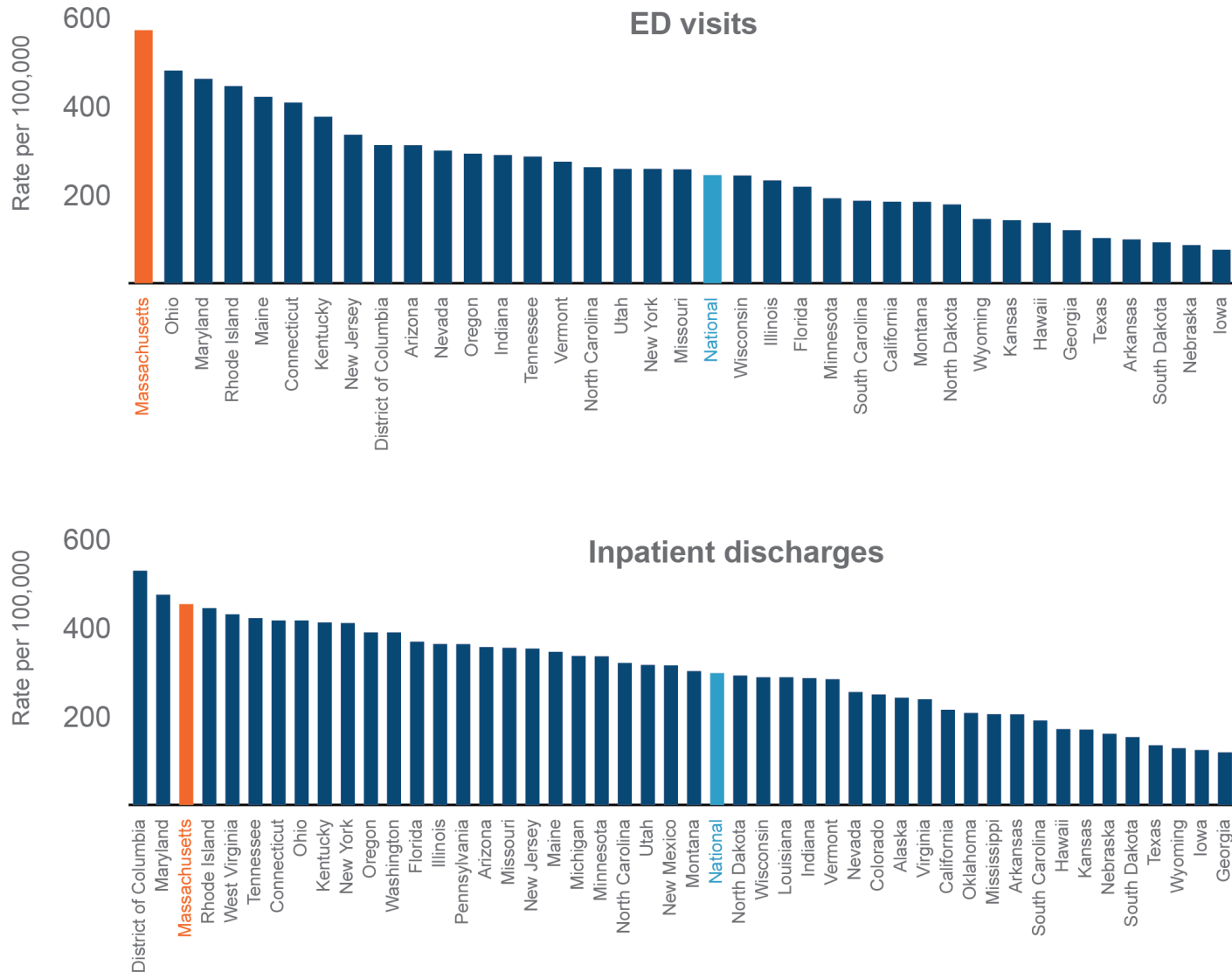
There were nearly 68,000 opioid-related hospital discharges in 2017, which represent 2.1% of hospital discharges.

In 2016, Massachusetts had the highest rate of opioid-related ED utilization and the third highest inpatient utilization among states that reported this data to the Agency for Healthcare Research and Quality (see next slide).

Source: Data: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge and ED Databases, 2010-2017.

Note: Dates are based on the federal fiscal year, which runs from October 1 to September 30. Some discontinuity in trends may exist between 2015 and 2016 due to the transition from ICD-9 diagnosis codes to ICD-10 diagnosis codes on October 1, 2015. From 2011 to 2014, the CHIA databases included only the patient's first 15 diagnosis codes. However, as of 2015 all of a patient's diagnosis codes are included. Please see methodology section for more detail about the impact of this change.

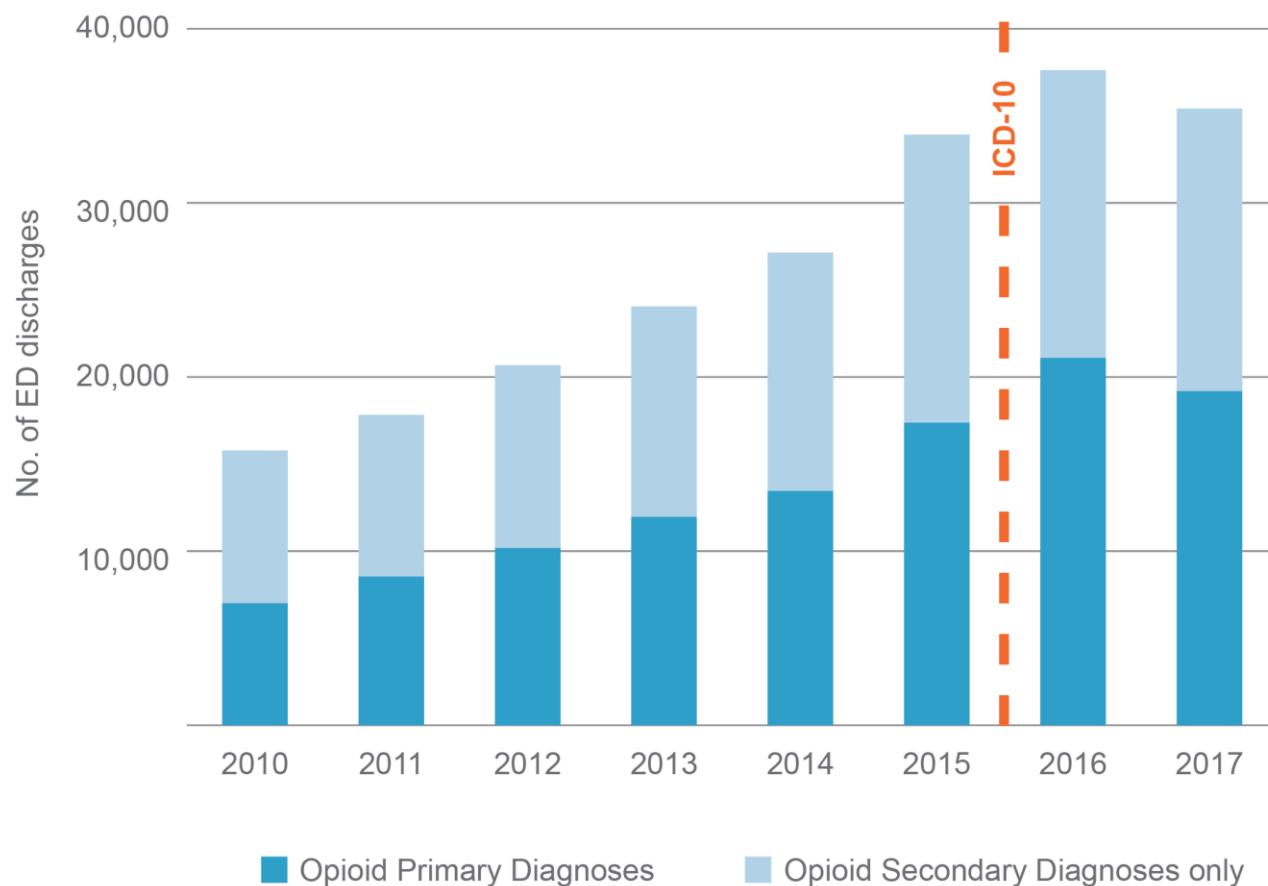
# Opioid-related hospital utilization by state, 2016





# Opioid-related acute care hospital ED utilization, 2010-2017

## ED



In 2017, ED visits represented just over half of all opioid-related utilization in acute care hospitals. Over half of those visits had an opioid-related primary diagnosis (e.g., dependence, poisoning, etc.).

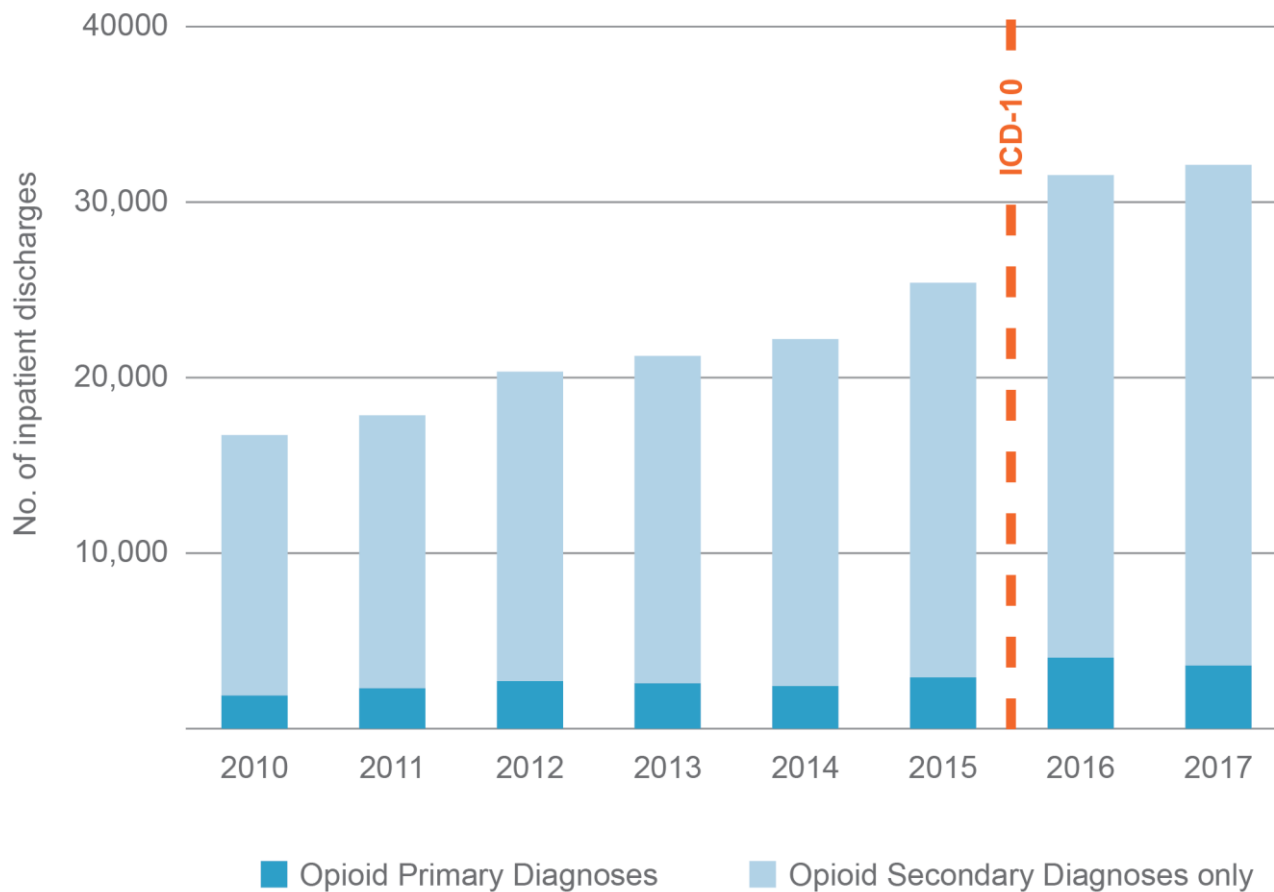
Between 2016 and 2017, the overall volume of opioid-related ED discharges decreased by 5.9%.

Source: Data: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital ED Databases, 2010-2017.

Note: From 2011 to 2014, the CHIA databases included only the patient's first 15 diagnosis codes. However, as of 2015 all of a patient's diagnosis codes are included. This had almost no impact on ED discharge counts, only 19 additional ED stays with secondary opioid-related diagnoses were counted between 2015 and 2017 due to the expansion of the number of diagnoses codes present in the data.

# Opioid-related acute care hospital inpatient utilization, 2010-2017

## Inpatient



Total opioid-related inpatient acute care hospital discharges increased slightly between 2016 and 2017. Discharges with an opioid-related primary diagnosis decreased.

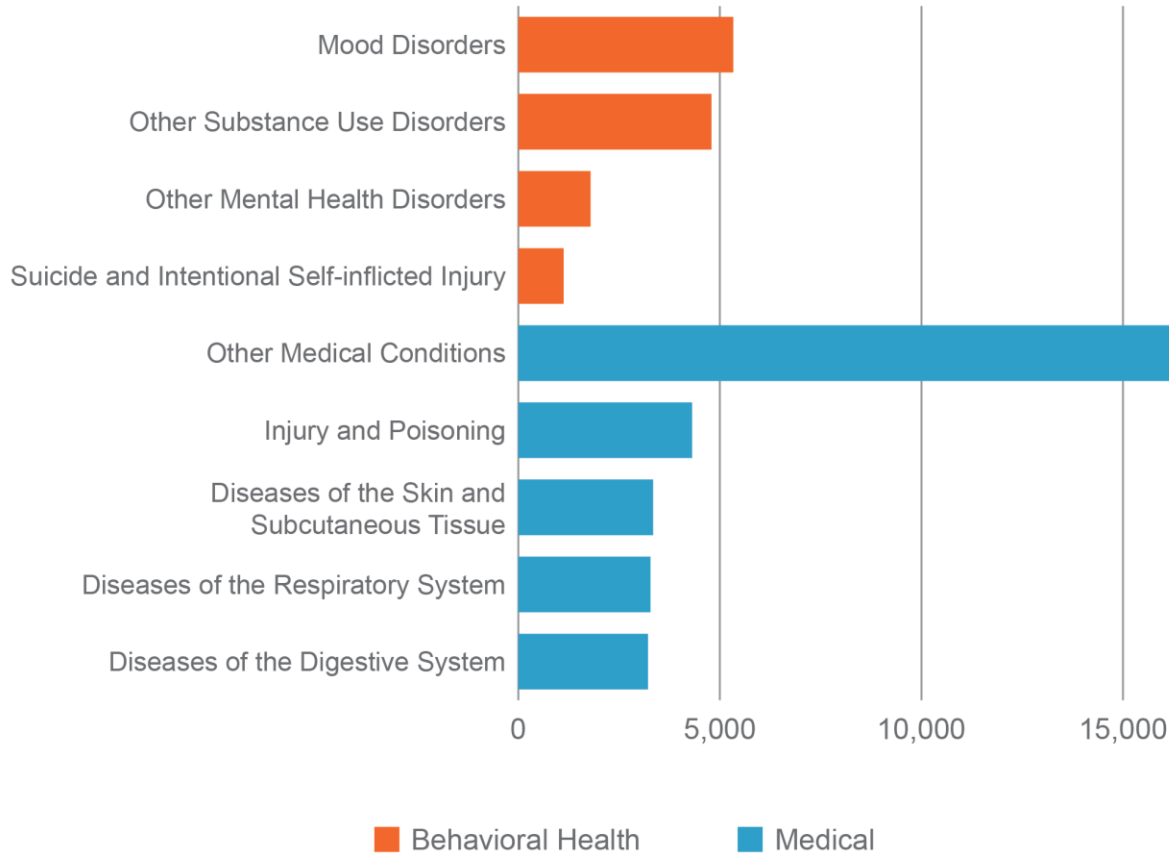
The vast majority of inpatient services for opioid use disorder (OUD) as a primary diagnosis occur in specialty hospitals, which do not submit discharge data to CHIA.\* Only 11% of opioid-related discharges from acute care hospitals had a primary opioid-related diagnosis in 2017.

Source: Data: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge Databases, 2010-2017.

\* HPC excluded discharges from two specialty sites, Mercy Medical Center Providence Behavioral Health Hospital Campus and Caritas Good Samaritan Medical Center Norcap Lodge Campus. They represent a different type of facility that captures and reports more data under these ICD codes, which skews the collective data for the regions in which these sites operate.

# Primary diagnoses for discharges with secondary opioid-related diagnoses, 2017

## ED and Inpatient



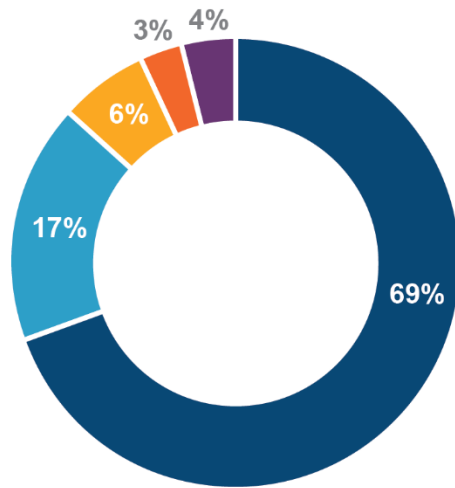
The primary diagnoses for patients with an ED or inpatient discharge carrying a secondary opioid-related diagnosis varied widely.

Some of the most common primary diagnoses for these patients included mood disorders, other substance use disorders, and injury and poisoning. Most discharges with an opioid-related secondary condition fell into a wide variety of primary medical diagnoses.

# Opioid-related ED visits, percent of patients by number of visits, 2017

## ED

### % of Patients by Number of ED Visits



1 ED Visit

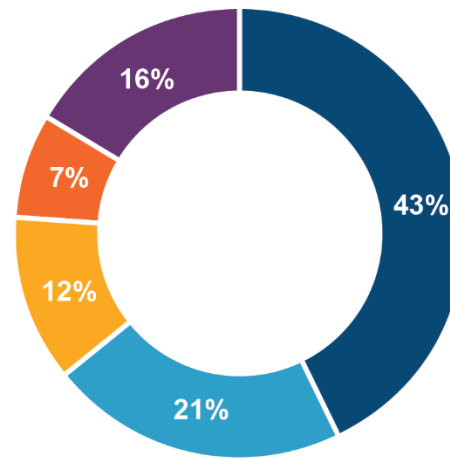
2 ED Visits

3 ED Visits

4 ED Visits

5+ ED Visits

### % of Discharges by Patients' Number of ED Visits



In 2017, more than two-thirds (69%) of patients who visited the ED with an opioid-related diagnosis had only one opioid-related ED visit during the year; 31% of unique patients had more than one ED visit.

However, the majority of all opioid-related ED visits were by patients with more than one visit. Patients with repeat visits accounted for 57% of all ED visits with opioid-related codes.

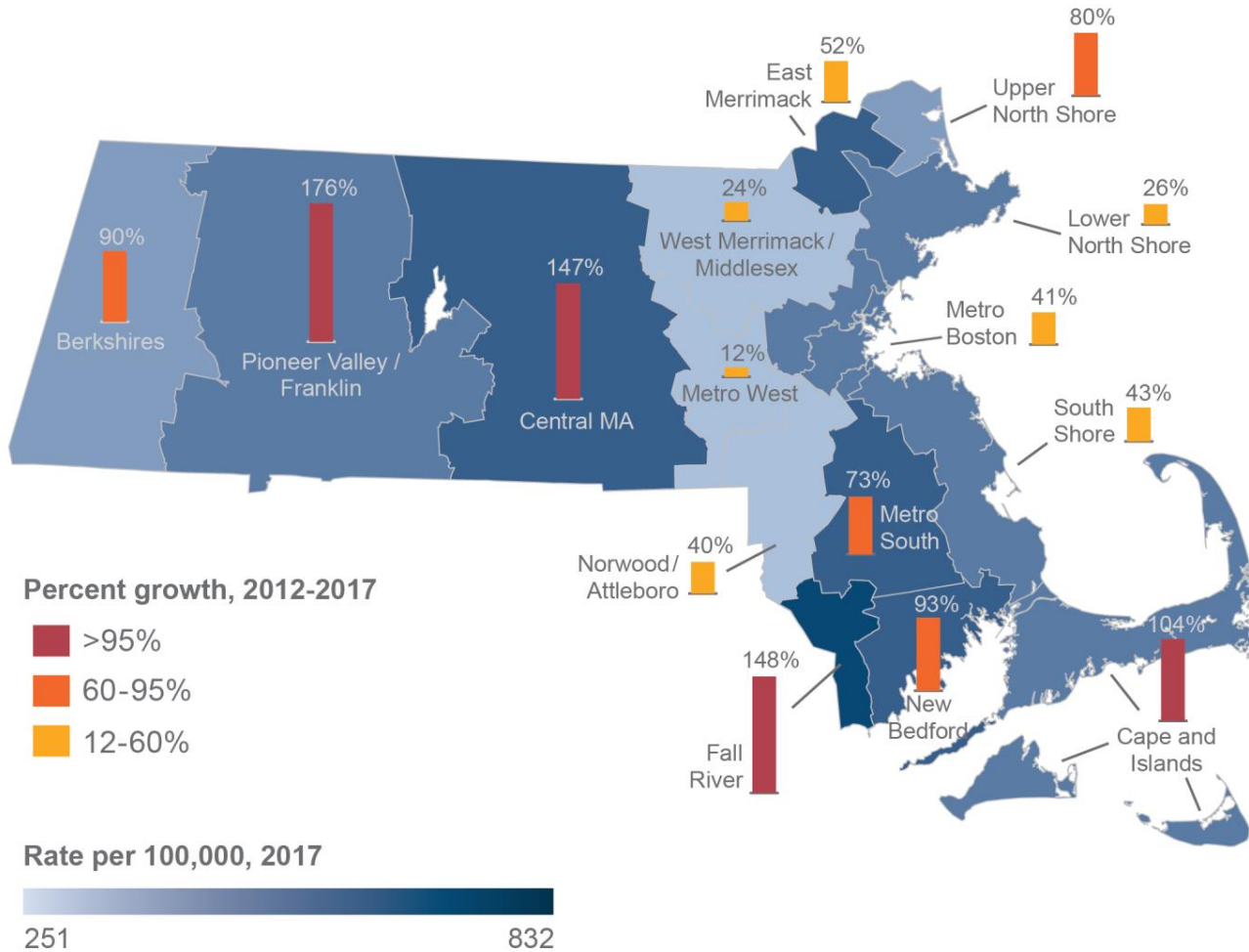
On average in 2017, patients with opioid-related ED visits had 1.62 visits.

Source: Data: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital ED Database, 2017.

Note: This calculation was completed on those records with valid unique health identification numbers (UHINs). 5.3% of inpatient opioid discharges were missing UHINs and 22% of ED discharges were missing UHINs.

# Opioid-related ED discharges by HPC regions of patients' residence, 2012 and 2017

ED

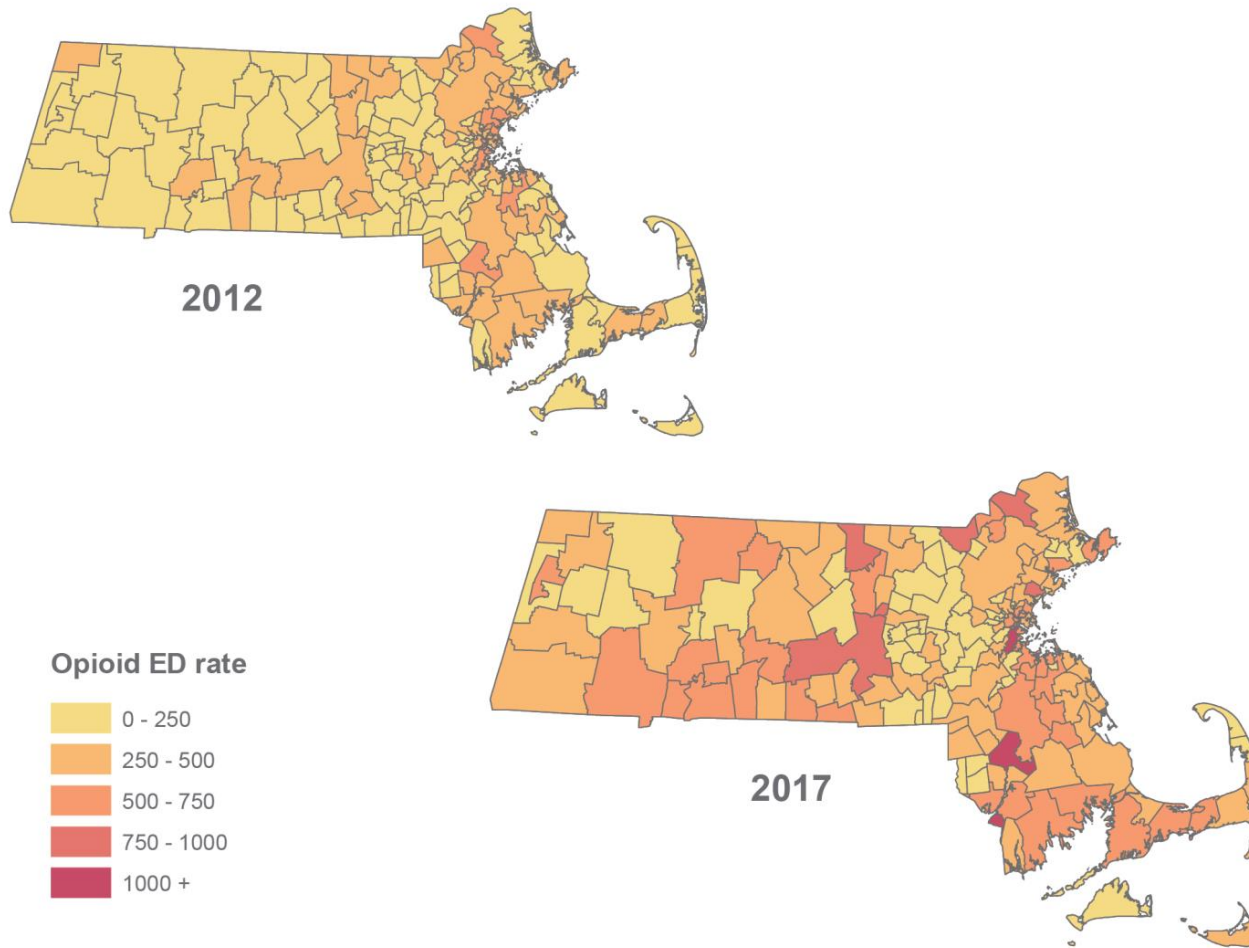


In 2017, Fall River and Metro South had the highest rate of opioid-related ED discharges, with 832 and 721 discharges per 100,000 people, respectively. In contrast, Metro West had the lowest rates of both ED and inpatient opioid-related discharges in 2017, with 251 per 100,000.

In nearly all HPC regions, the rate of opioid-related ED discharges has increased dramatically since 2012. Metro West and Lower North Shore (which had among the highest such rates in 2012) had relatively low but still positive increases.

# Opioid-related ED discharges by primary care service area of patient residence, 2012 and 2017

ED



As in 2012, in 2017 there was considerable variation in opioid-related ED utilization across the Commonwealth. But in most service areas, the rate increased over that five-year period.

For example, of 147 primary care services areas (PCSAs) in Massachusetts, 10 had at least 750 opioid-related ED discharges per 100,000 population. There were no PCSAs with such rates in 2012.

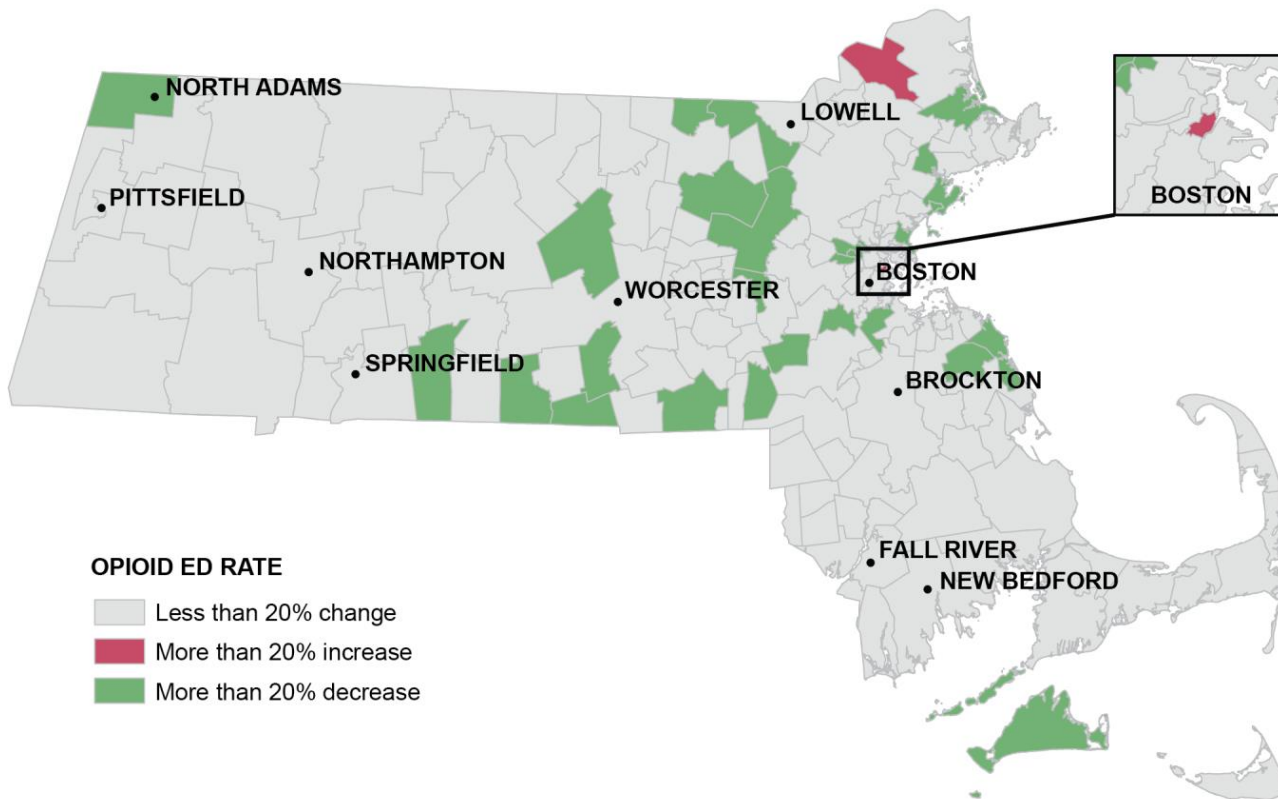
PCSAs are determined by the Human Resources and Services Administration based on patient utilization patterns.

Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), ED Databases, 2012 and 2017, and U.S. Census Bureau, ACS 5 year population estimates by Zip Code Tabulation Areas, 2012 and 2017; Health Resources and Services Administration (2013). Primary Care Service Area Data: "2013 Zip5 to PCSA v3.1 crosswalk" and "PCSA Geographic shape files." Available at: <https://data.hrsa.gov/hdw/data/dataDownload/pcsa2010download.aspx>

Note: Mapped to primary care service areas by a patient's permanent zip code, not site of care. 2017 data include opioid-related discharges identified using all of a patient's diagnosis codes.

# Change in opioid-related ED discharges by primary care service area of patient residence, 2016-2017

ED



Between 2016 and 2017, the percent of opioid-related ED discharges increased more than 20% in only two PCSAs, while 28 PCSAs experienced a decrease of such visits of more than 20%.

The PCSAs with the largest increases included the Haverhill area (22% increase) and the Chinatown and Downtown Crossing neighborhoods of Boston (25% increase).

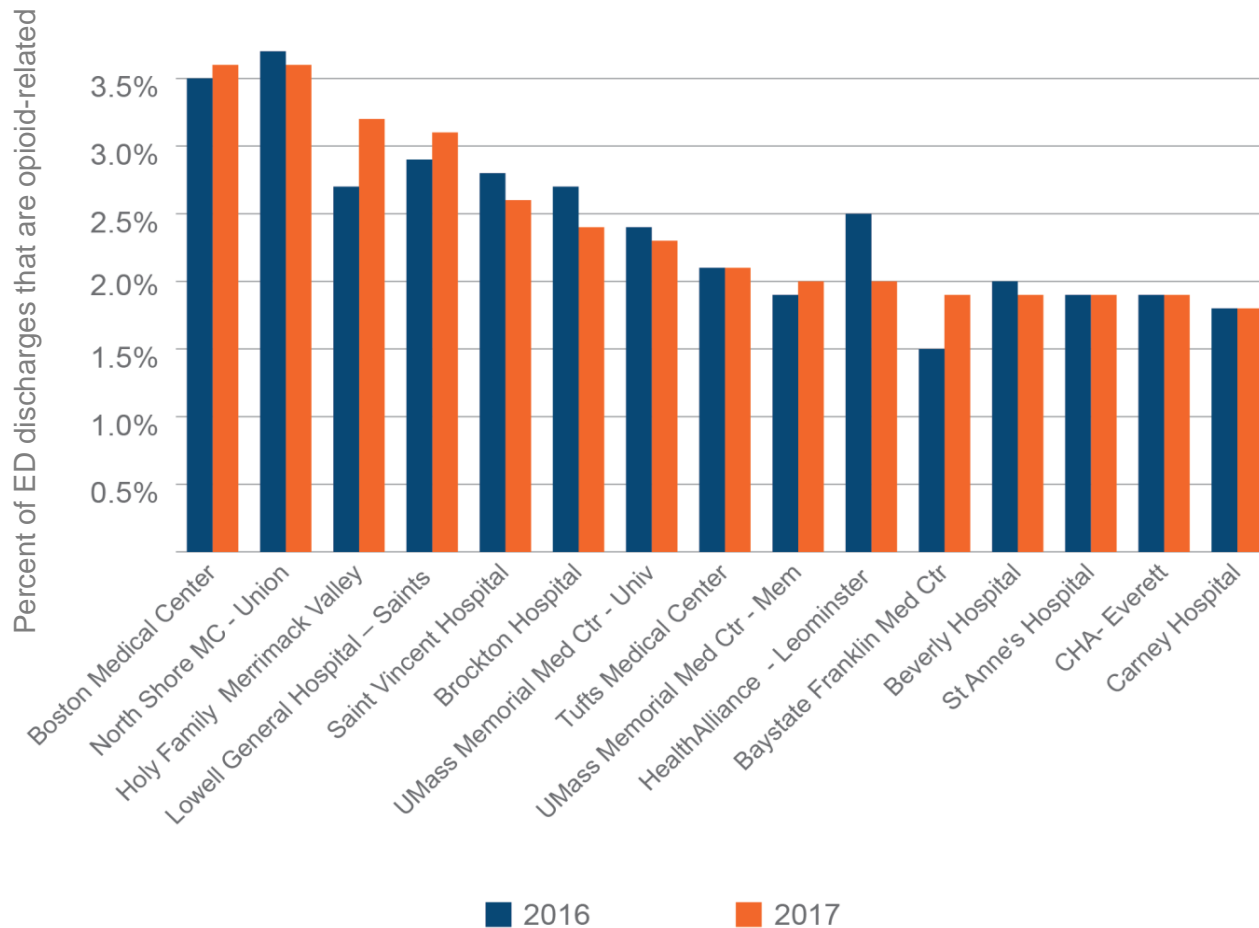
Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital ED Databases, 2012, 2017, and ACS 5 year population estimates by Zip Code Tabulation Areas, 2016, 2017. Health Resources and Services Administration (2013). Primary Care Service Area Data: "2013 Zip5 to PCSA v3.1 crosswalk" and "PCSA Geographic shape files." Available at: <https://data.hrsa.gov/hdw/data/dataDownload/pcsa2010download.aspx>

Note: PCSAs with 25 or fewer discharges in either year are shaded grey for purposes of this figure.



# Opioid-related ED discharges, top 15 hospitals, 2016-2017

## ED



The percent of ED visits that were opioid-related varied by hospital and declined slightly from an average of 1.5% in 2016 to 1.4% in 2017. In 2017, Boston Medical Center (BMC) had both the highest proportion of opioid-related ED discharges and also the greatest absolute volume of ED discharges.

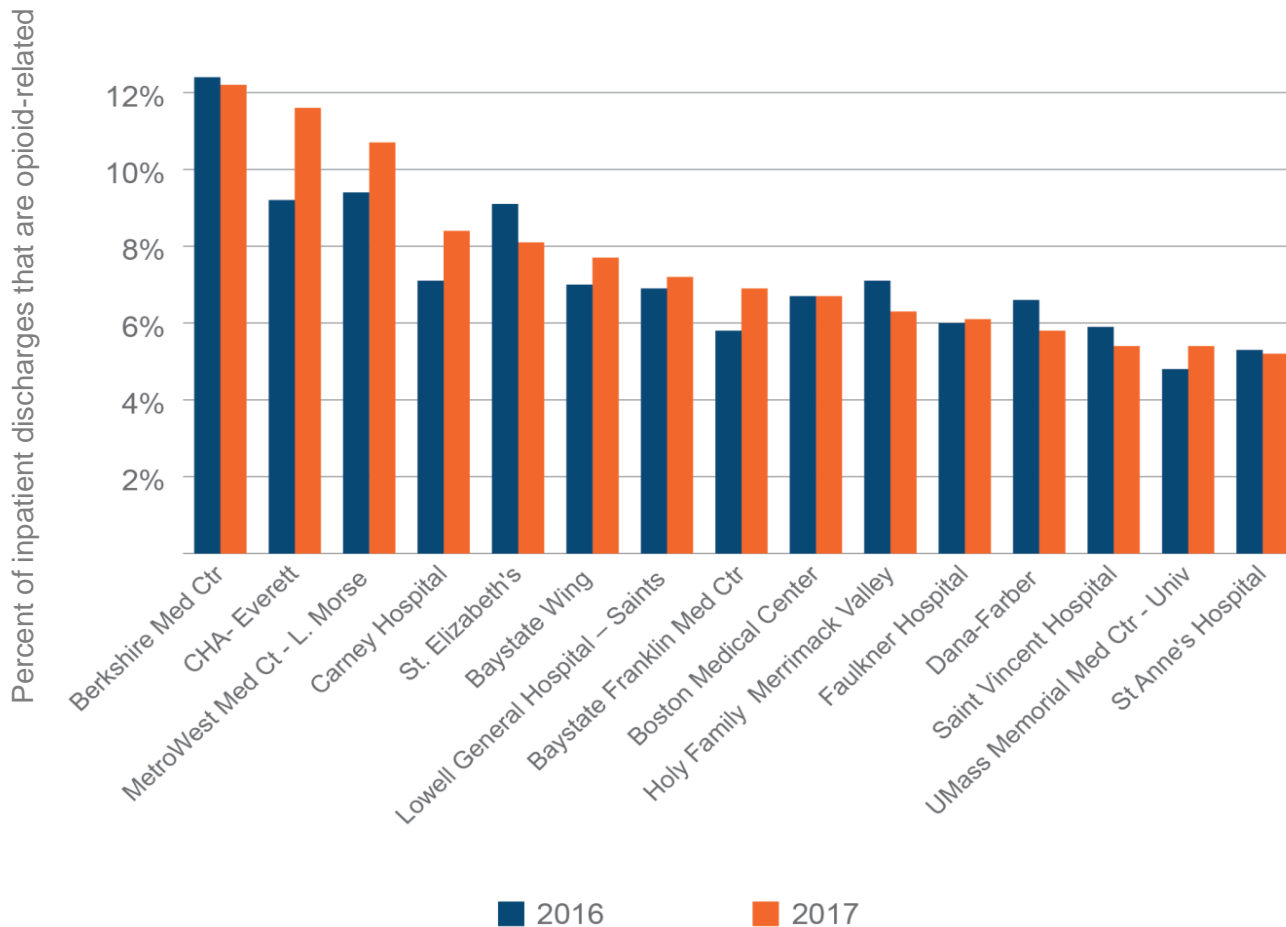
The EDs with both high volume and percent of opioid-related discharges included BMC, UMass Memorial-University Campus, Signature Health Care-Brockton Hospital, Saint Vincent Hospital, Lowell General Hospital-Saints Campus, Carney Hospital, UMass Memorial HealthAlliance Hospital Leominster, Saint Anne's Hospital, and Cambridge Health Alliance-Everett Hospital.

Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital ED Databases, 2016 and 2017.  
 Note: Hospitals with fewer than 100 opioid-related discharges were excluded from this analysis.



# Opioid-related hospital inpatient discharges, top 15, 2016-2017

## Inpatient



While there was substantial variation by hospital, on average in 2017 roughly 4% of inpatient discharges were opioid-related (i.e., primary or secondary diagnoses) – double the average in 2010.

Of the 15 hospitals with the highest rates of opioid-related inpatient discharges in 2017, 7 had higher rates in 2017 than 2016.

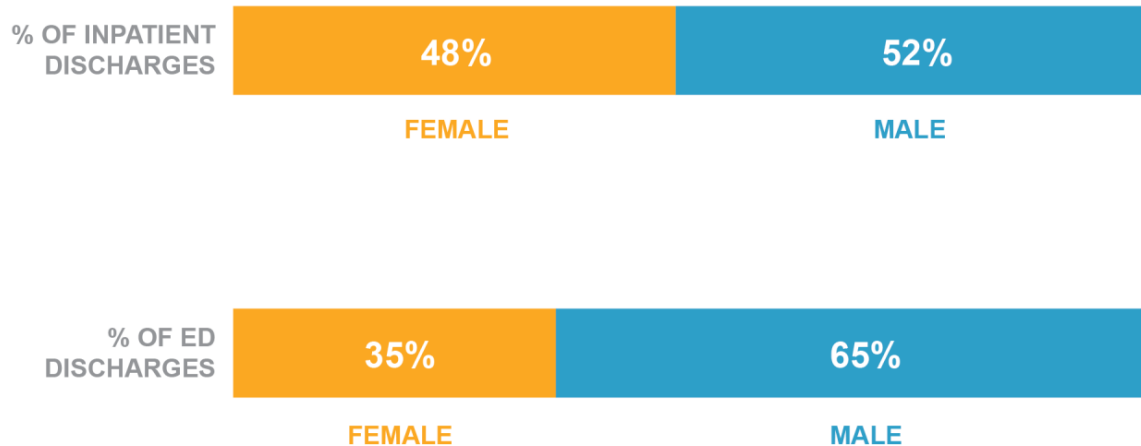
The high percent of inpatient discharges that are opioid-related for Berkshire Medical Center may be due to its being the only inpatient substance use disorder specialty provider in the area. Berkshire Medical Center, St. Elizabeth's Medical Center, and Faulkner Hospital are the Commonwealth's only acute care hospitals with on-site beds that are licensed to provide withdrawal management services.

Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge Databases, 2016 and 2017.

Note: Hospitals with fewer than 100 opioid-related discharges were excluded from this analysis. Two hospitals that specialize in behavioral health care (Mercy Medical Center Providence Behavioral Health Hospital Campus and Caritas Good Samaritan Medical Center Norcap Lodge Campus) were removed from this analysis. Clinton Hospital was removed from this analysis due to differences in reporting between 2016 and 2017 data.

# Opioid-related hospital discharges by sex, 2017

## Inpatient and ED

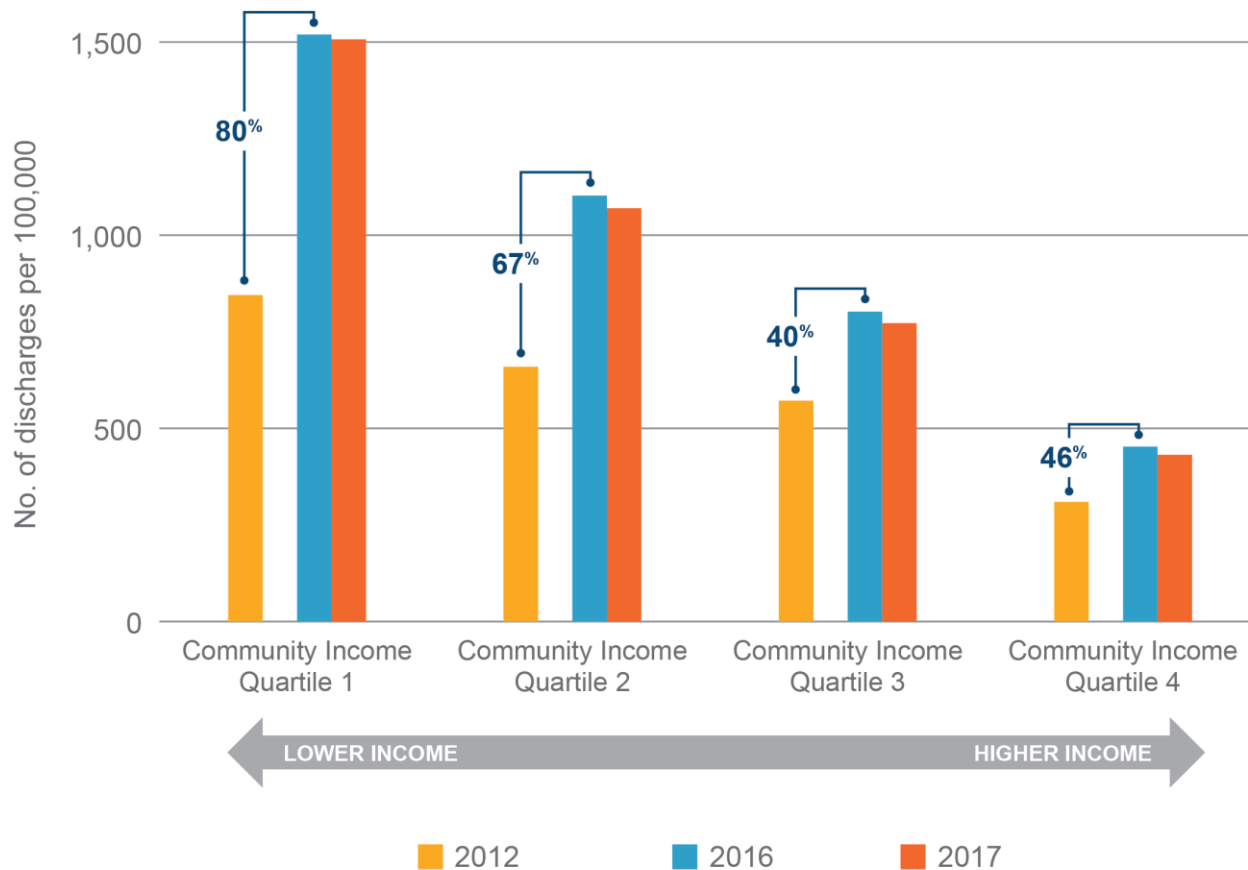


Patients with opioid-related inpatient discharges were 48% female and 52% male in 2017. In contrast, patients with opioid-related ED discharges were 35% female and 65% male.

Overall, patients with opioid-related hospital discharges were 41% female and 59% male in 2017; this proportion has not changed since 2012.

# Opioid-related hospital discharge rates per 100,000 by community income quartile, 2012, 2016, and 2017

## Inpatient and ED



Residents of the lowest income quartile areas of the state had the highest rate of opioid-related hospital discharges in 2017. Despite accounting for only 25% of the Commonwealth's population, these residents accounted for 40% of all opioid-related discharges. Those living in the highest income quartile areas of the state accounted for 11% of opioid-related discharges.

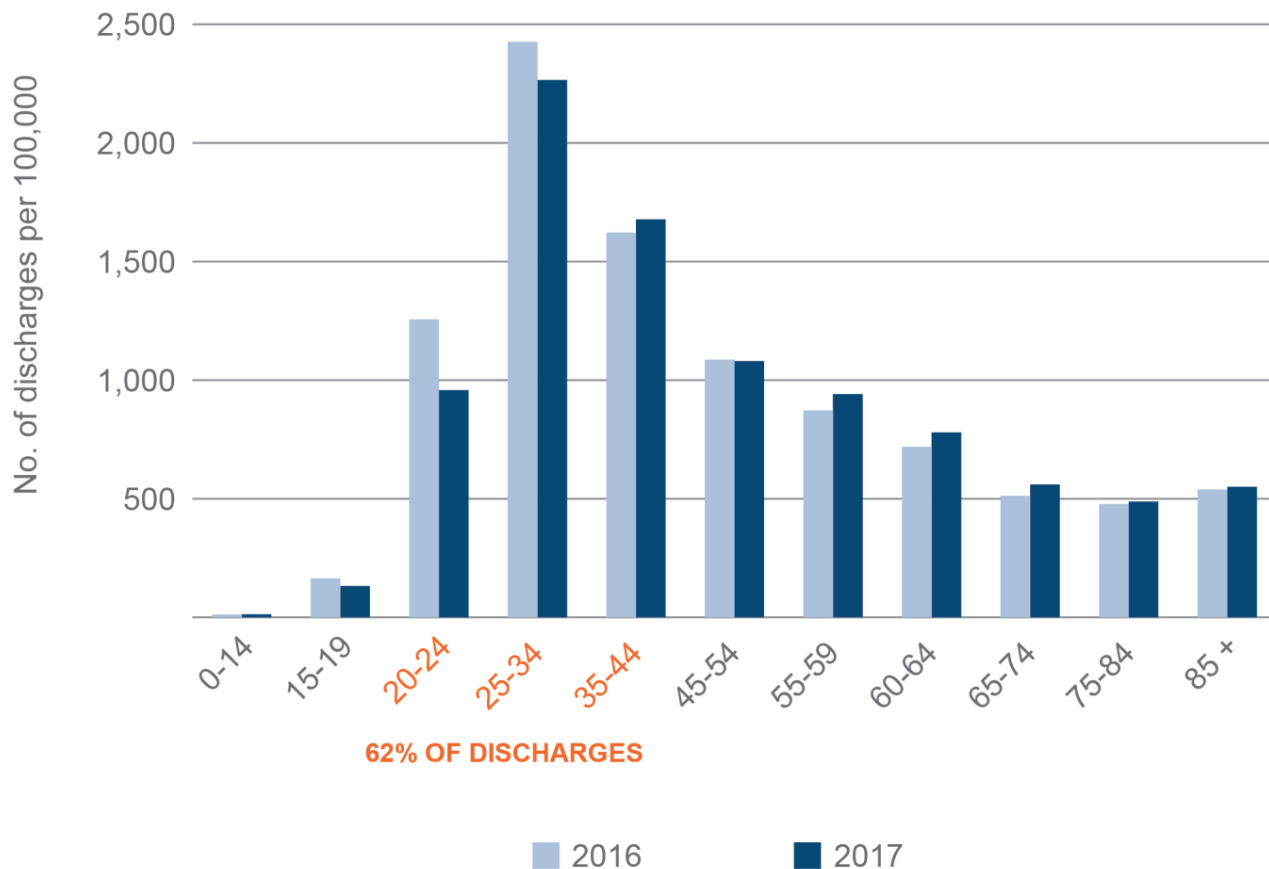
The rate of opioid-related discharges in the highest income quartile increased by 46% between 2012 and 2016, compared to 80% in the lowest income quartile. From 2016 to 2017, opioid-related hospital discharge rates declined by less than 1% in the lowest income communities compared to 4.6% in the highest income communities.

Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge and ED Databases, 2012, 2016, 2017, and U.S. Census, ACS 5 Year Population Estimates, Median Income by Zip Code Tabulation Areas (ZCTA), 2012 and 2017.

Note: Income quartiles were calculated from 2017 median income by ZCTA and are based on the median income of a patient's residential community, rather than the patient's actual income.

# Opioid-related hospital discharge rates per 100,000 by age group, 2016 and 2017

## Inpatient and ED

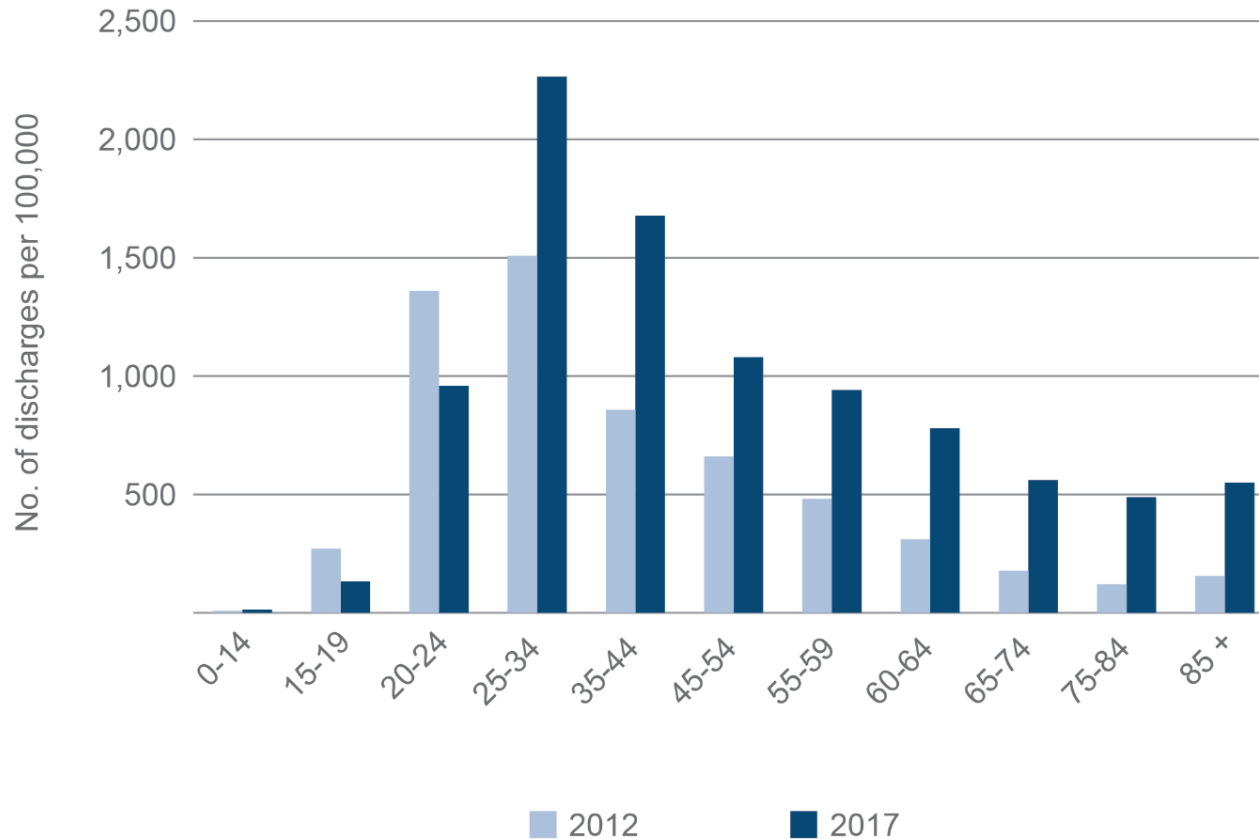


While the rate of opioid-related discharges for older adults increased from 2016 to 2017, the rate among patients under 35 declined overall. The largest decline occurred among patients between 20 and 24 years old (24% decrease).

Despite those declines, opioid-related hospital discharges remain disproportionately concentrated among younger adults. Although people between the ages of 20 and 44 represent only 33% of the Commonwealth's population, patients in this age group accounted for 62% of opioid-related hospital discharges in 2017. Patients aged 25-34 still had the highest rate of opioid-related discharges (2,265 per 100,000 people) in 2017.

# Opioid-related hospital discharge rates per 100,000 by age group, 2012 and 2017

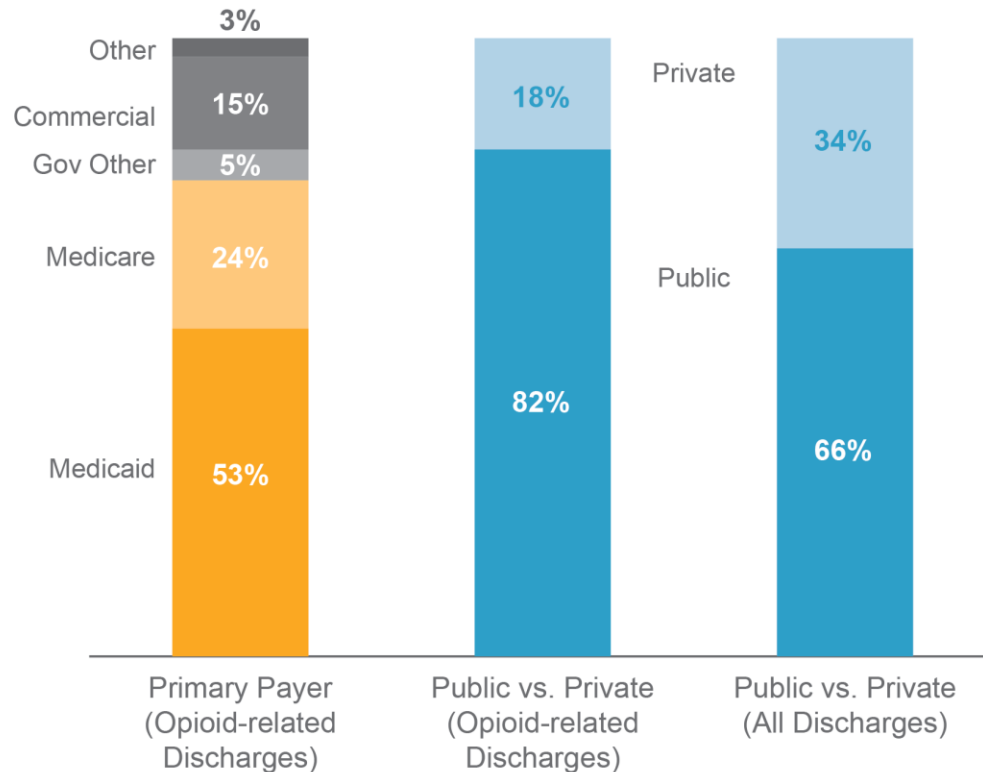
## Inpatient and ED



From 2012 -2017, the rate of opioid-related inpatient and ED discharges declined among patients under age 25 but increased substantially in all older age groups.

# Opioid-related hospital discharges by primary payer, 2017

## Inpatient and ED



Public payers cover a disproportionate share of opioid-related hospital discharges. In 2017, 82% of opioid-related discharges were covered by public payers compared to 66% of all discharges. There was no significant change in these figures between 2016 and 2017.

MassHealth pays for an especially large share of opioid-related hospital discharges. MassHealth members accounted for approximately half of all opioid-related discharges in 2017, despite comprising only 23% of the Commonwealth's population.\*

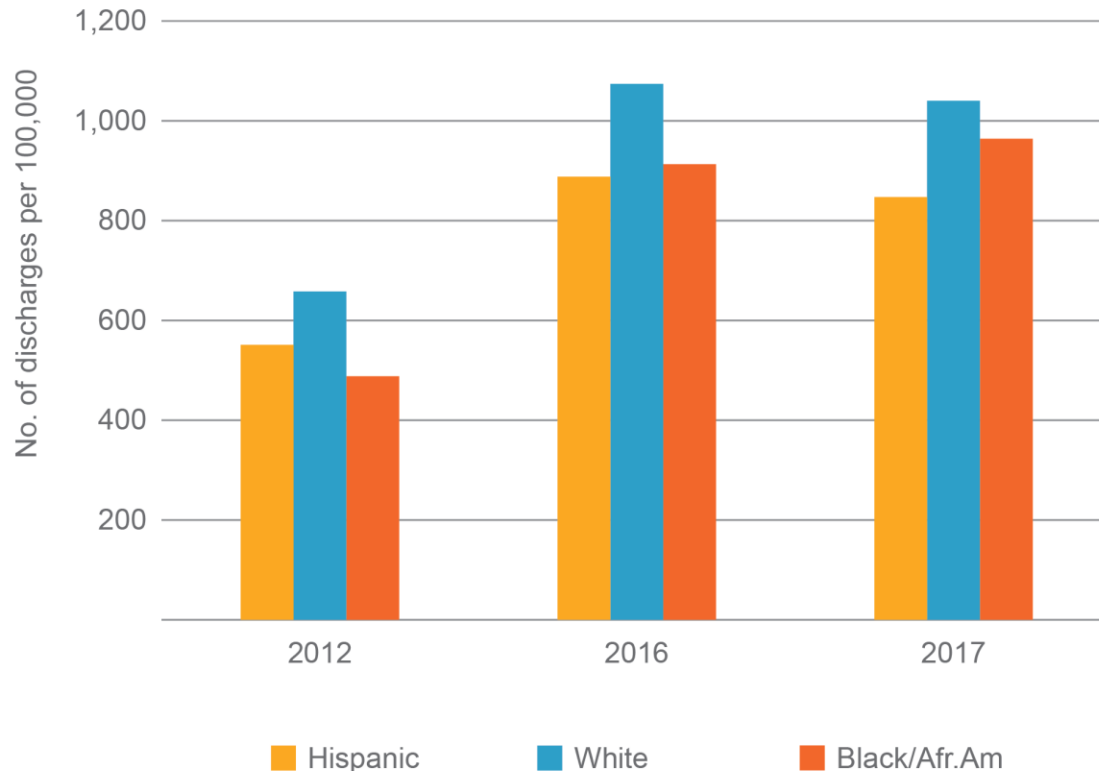
Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge and ED Databases, 2017.

\* Based on HPC analysis of 2017 ACS Medicaid/Means-tested Public Coverage. Accessed April 24, 2019.

Note: Public payer includes Medicaid and Medicare; private includes all other payers. Discharges with no payer category identified were excluded.

# Opioid-related hospital discharge rates per 100,000 by race and ethnicity, 2012, 2016, and 2017

## Inpatient and ED



In 2017, patients identified in the data as non-Hispanic White had the highest rate of opioid-related discharges (1,040 discharges per 100,000 people) but experienced a 3% decrease from 2016. Those identified as Hispanic also experienced a 4.6% reduction in the rate of opioid-related discharges between 2016 and 2017.

However, the rate increased more than 5% from 2016 to 2017 among those identified as Black/African American, to 964 discharges per 100,000.

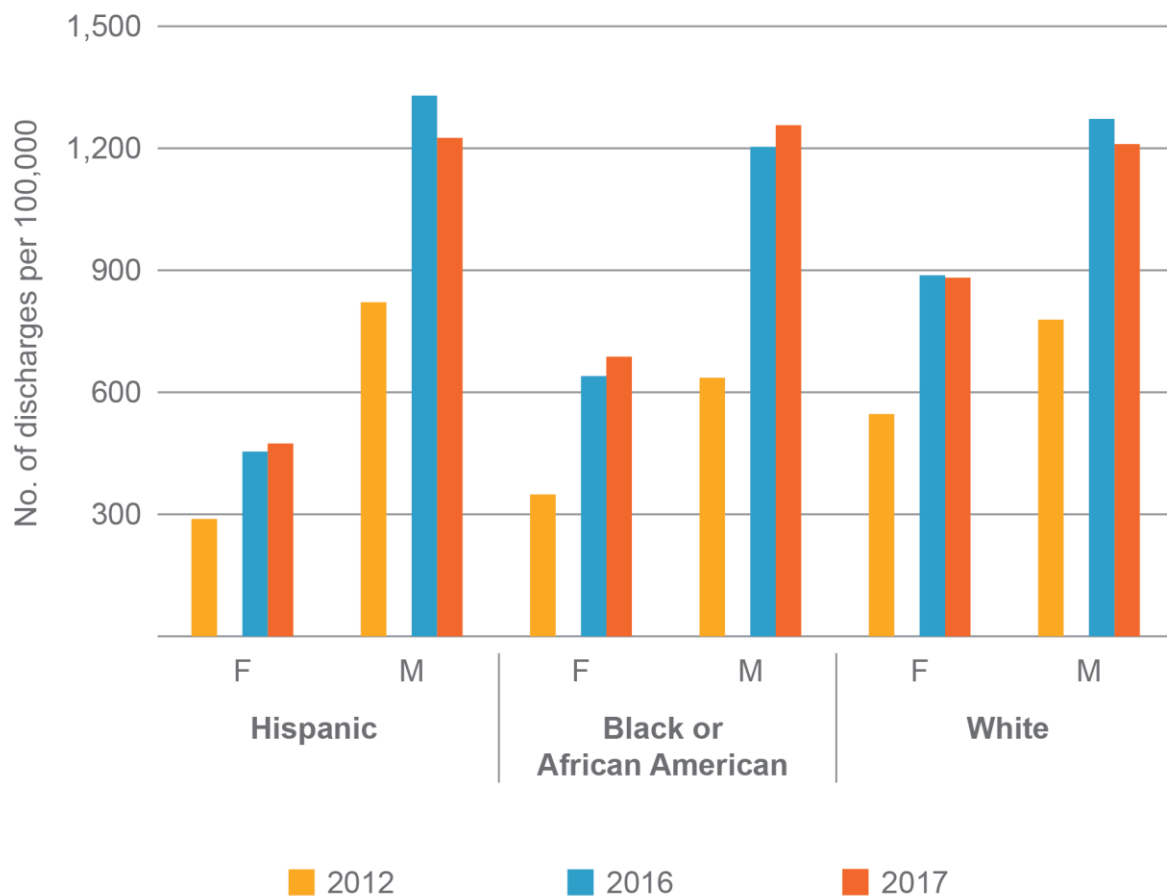
For all individuals with race identifiers available in the data, the rate increased by 58% between 2012 and 2017; among those identified as Black/African American, the rate increased by 98% in that time period.

Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge and ED Databases, 2012, 2016, 2017; U.S. Census, ACS 5 Year demographic and housing estimates, 2012, 2016, 2017.

Notes: U.S. Census data used for the calculation of the rate included only people with single race. The census estimates of multi-racial populations are not included in the rate calculation. Racial data from the Hospital Inpatient Discharge Database may classify people with two or more races differently than the census data does, so rates per 100,000 should be interpreted with caution. Each year's rate is calculated in the same manner, so the rates can be compared over time. The analysis does not include racial classifications of Asian or Other, as each had low numbers and together comprised 2% of the data. Racial data was missing from 1.6% of opioid-related discharges.

# Opioid-related hospital discharge rates per 100,000 by race, ethnicity, and sex, 2012, 2016, and 2017

## Inpatient and ED



The rate of opioid-related hospital discharges is higher among men than women, regardless of race. This rate differential is particularly pronounced for individuals identified in the data as Hispanic; Hispanic women have the lowest rate of opioid-related hospital discharges, while Hispanic men have among the highest rates.

In 2017, those identified in the data as Black/African American men had the highest rate of opioid-related hospital discharges (1,256 discharges per 100,000).

For all races identified in the data, between 2016 and 2017 men had either larger decreases or smaller increases in opioid-related discharge rates than women.

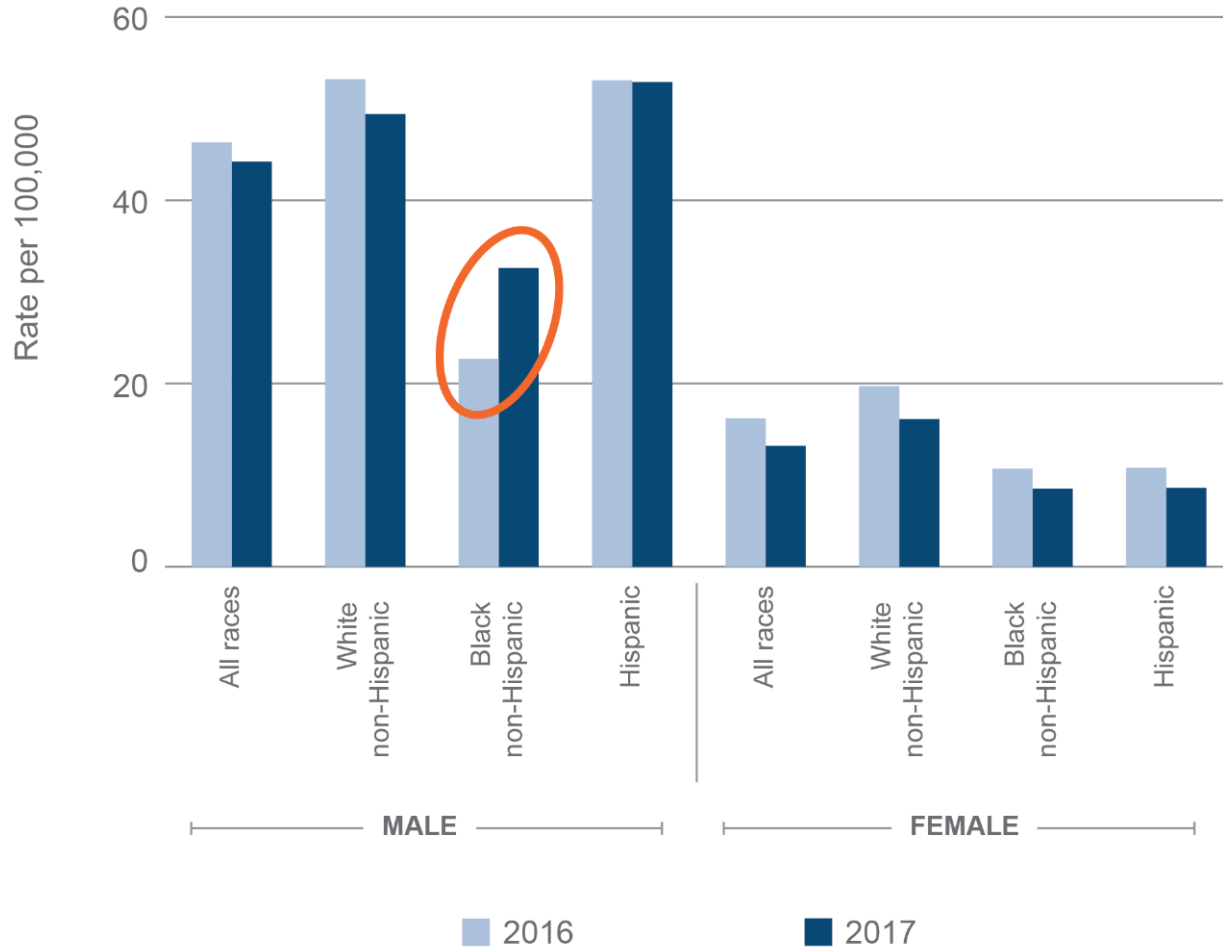
Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge and ED Databases, 2012, 2016, 2017; U.S. Census, ACS 5 Year demographic and housing estimates, 2012, 2016, 2017.

Notes: U.S. Census data used for the calculation of the rate included only people with single race. The census estimates of multi-racial populations are not included in the rate calculation. Racial data from the Hospital Inpatient Discharge Database may classify people with two or more races differently than the census data does, so rates per 100,000 should be interpreted with caution. Each year's rate is calculated in the same manner, so the rates can be compared over time. The analysis does not include racial classifications of Asian or Other, as each had low numbers and together comprised 2% of the data. Racial data was missing from 1.6% of opioid-related discharges.



# Opioid-related overdose death rates per 100,000 by race, ethnicity, and sex, 2016 and 2017

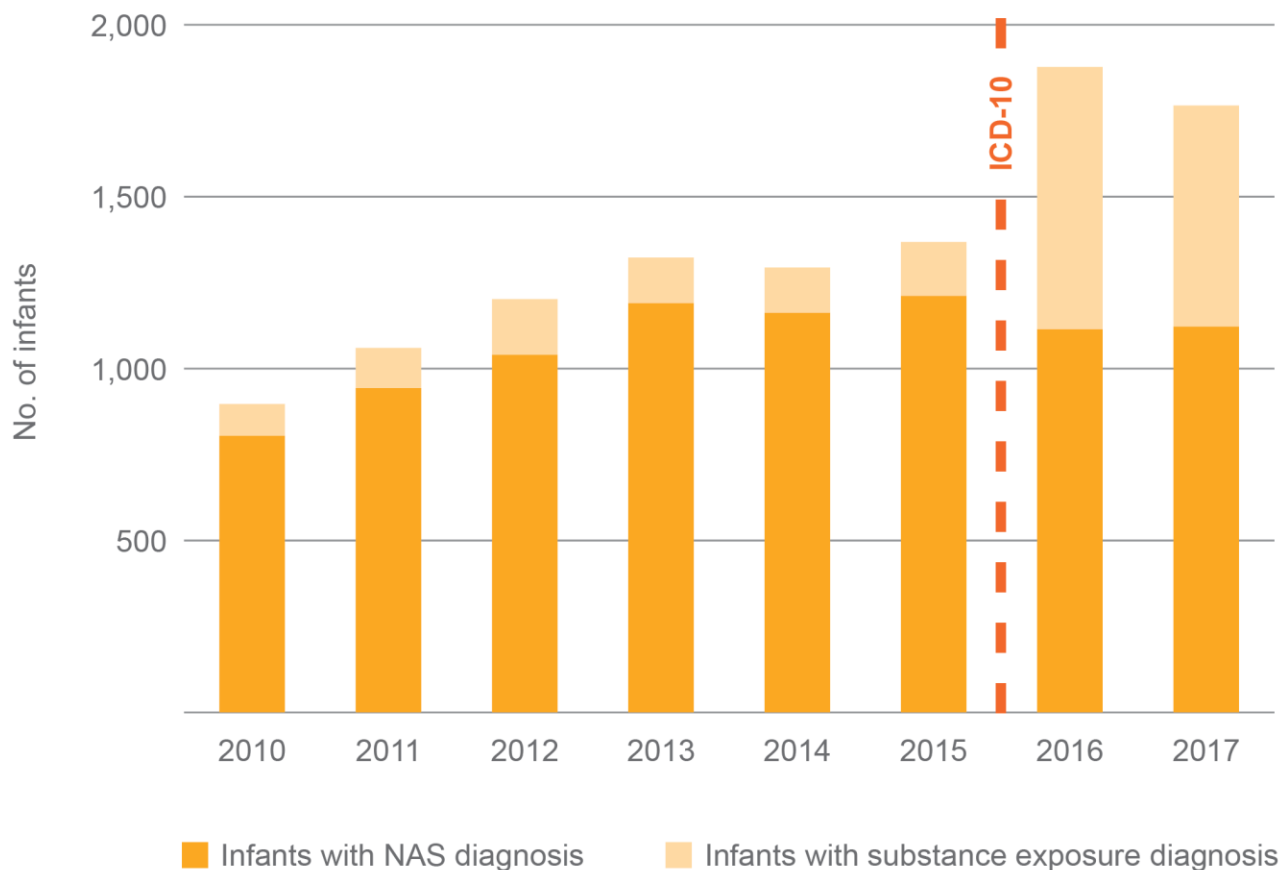
## Inpatient and ED



Opioid-related overdose death rates also vary by race and ethnicity, and further by sex. The rate for non-Hispanic black males rose 44% between 2016 and 2017. Within the race categories available in the data, no other group's fatal overdose rate increased during this time.

# Number of infants diagnosed with neonatal abstinence syndrome or substance exposure related to opioid use, 2010-2017

## Infants with NAS and/or SEN



The number of infants born with neonatal abstinence syndrome (NAS) climbed steadily from 2010 to 2013, and then leveled off between 2013 and 2015.

While the total number of infants with these diagnoses increased between 2015 and 2016, it is unclear how much of the difference was due to coding changes versus epidemiological changes or improvements in clinicians' ability to identify these conditions.

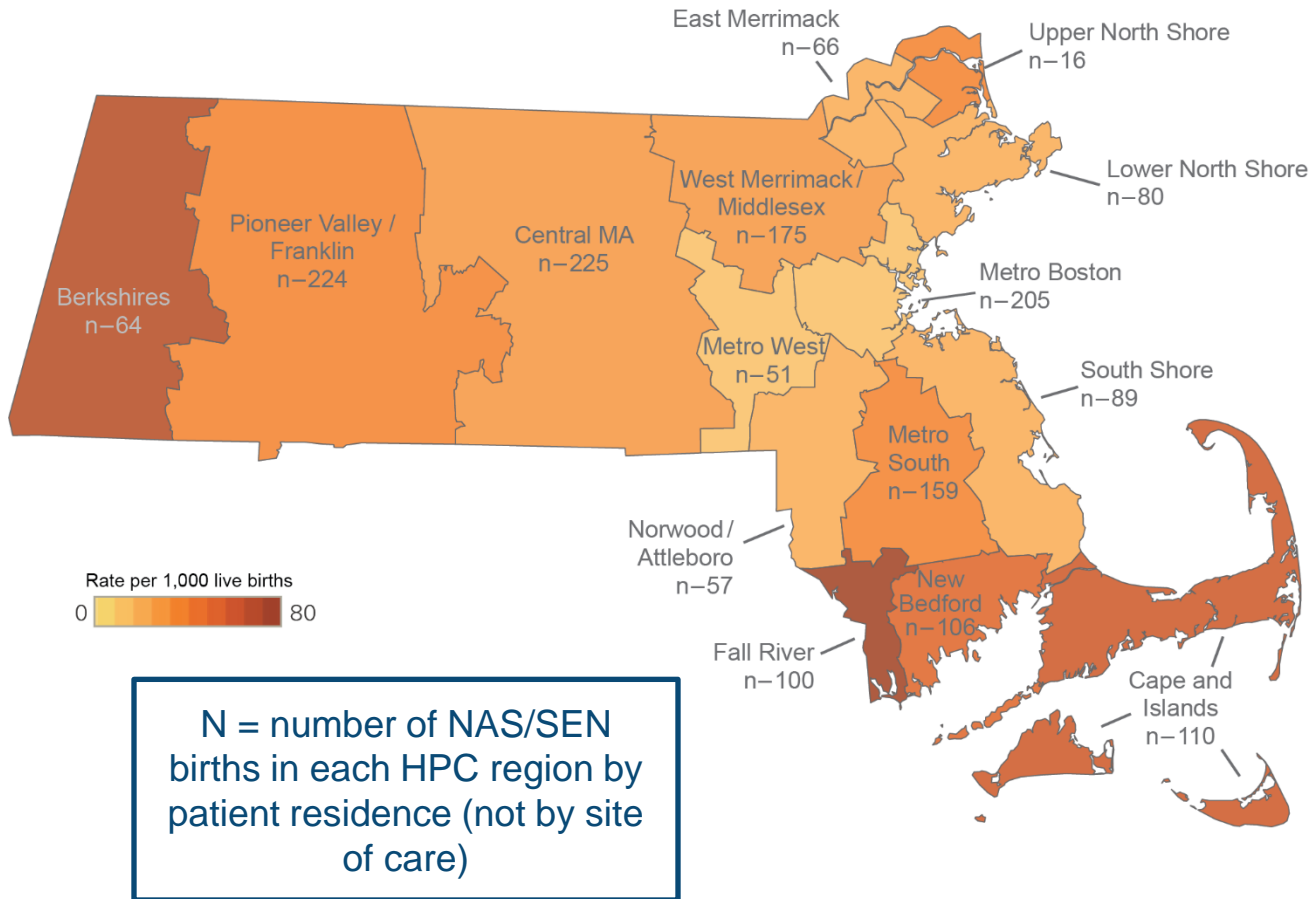
From 2016 to 2017, the number of infants coded with NAS or as substance exposed newborns (SEN) decreased 6% from 1,877 (26.5 per 1,000 live births) to 1,765 (25 per 1,000 live births), mirroring the decrease in both opioid-related mortality and hospitalizations over the same time period.

Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge Database, 2010 – 2017.

Notes: NAS was identified with the codes 7795 (ICD-9) or P961 (ICD-10). Substance exposure (i.e., exposure to substances in utero) was identified with the ICD-9 code 76072 (Narcotics affecting fetus or newborn via placenta or breast milk) or ICD-10 code P0449 (Newborn affected by maternal use of other drugs of addiction) in either primary or secondary diagnosis fields. While these SEN codes may include more than opioid use, there are other specific hallucinogens, which are coded with other drugs of addiction in ICD-10. Infants with both NAS and SEN were categorized only under an NAS diagnosis, since only a few records were coded with both and NAS is the more significant diagnosis.

# NAS/SEN births by HPC region of patients' residence and rates per 1,000 live births, 2017

## Infants with NAS and/or SEN



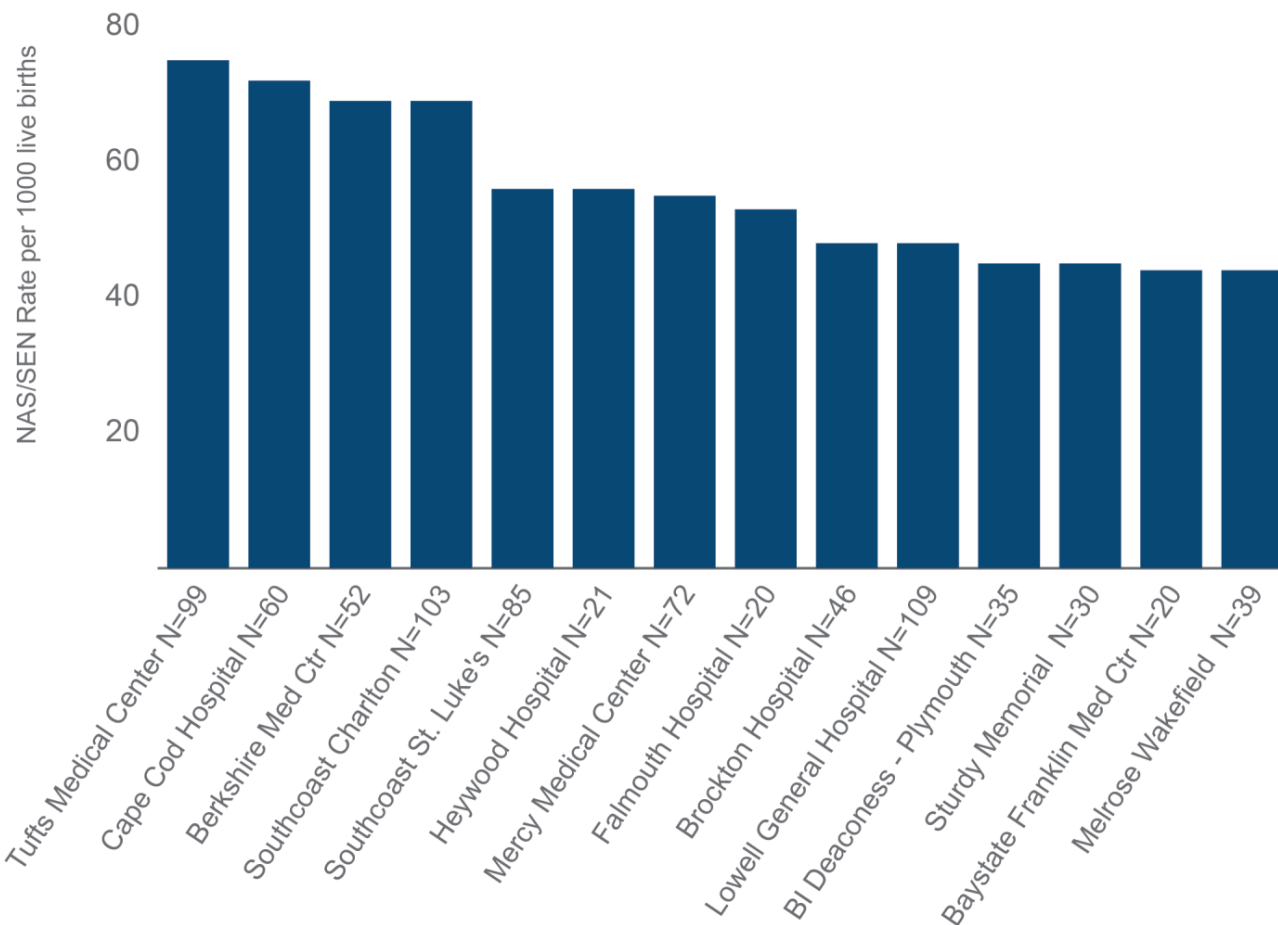
While the Central Massachusetts region had the highest number of NAS/SEN births in 2017, Southeastern Massachusetts – including the Fall River, Cape and Islands, and New Bedford regions – as well as the Berkshires had among the highest rates of NAS/SEN per 1,000 live births.

Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge, 2017.

Notes: NAS was identified with the codes 7795 (ICD-9) or P961 (ICD-10) and SEN was identified with the codes 76072 (ICD-9) or P0449 (ICD-10). Infants with both NAS and SEN were categorized only as having a NAS diagnosis. Because there is inconsistency between providers in coding NAS or SEN, the data shown here represent combined NAS/SEN rates.

# NAS/SEN discharges and rate per 1,000 live births at highest rate hospitals, 2017

## Infants with NAS and/or SEN



The hospitals with the highest rates of NAS/SEN births – Tufts Medical Center, Cape Cod Hospital, Berkshire Medical Center, and Southcoast-Charlton – all had rates between 69 and 75 per 1,000 live births.

Source: HPC Analysis of the Center for Health Information and Analysis (CHIA), Hospital Inpatient Discharge, 2017.

Notes: NAS was identified with the code P961( ICD-10) or 7795 (ICD-9) and SEN was identified with the code P0449 (ICD-10) or 76072 (ICD-9). Infants with both NAS and SEN, were categorized only under NAS diagnosis. Because there is inconsistency between providers in coding NAS or SEN, the data shown here represent combined NAS/SEN rates. Hospitals with fewer than 12 NAS or SEN related discharges were excluded.

# Conclusion

This third analysis by the HPC of the impact of opioid use on acute care utilization is meant to inform ongoing efforts to improve the Massachusetts health care system's ability to address the needs of those most affected. The findings in this chartpack demonstrate that statewide opioid-related hospital utilization declined for the first time between 2016 and 2017, but remained high and variable.

This encouraging overall trend may reflect recent investments by state and local institutions to curb opioid-related morbidity, mortality, and ED and inpatient utilization. Still, the updated data show that Massachusetts has one of the highest opioid-related mortality rates in the nation and underscore the need for continued improvements – such as greater access to evidence-based treatment, especially medication to treat addiction and co-occurring disorders, and to naloxone, the drug that counteracts overdose. Efforts also should be made to more systematically identify pregnant women whose children may be exposed to substances in utero, and initiate appropriate care for them and their infants.

The data also demonstrate increases in opioid-related hospital discharges among Massachusetts residents identified as Black/African American and growing disparities in discharge rates between those in lower and higher income areas. The Commonwealth should continue to monitor these trends. Future analyses should continue to track opioid-related utilization by key demographic indicators to ensure that policy solutions are appropriately targeted to the needs of specific subpopulations.

The HPC will continue to support efforts to understand and respond to the impact of opioid-related utilization on the health care system. One of the agency's most recent investment initiatives, the SHIFT-Care program, supports nine hospitals initiating buprenorphine in the emergency department, providing naloxone to patients with OUD, and connecting them to outpatient treatment. Other HPC investment programs have focused on improving care for infants born with NAS and increasing behavioral health care access through telemedicine. The HPC also will continue to leverage its care delivery certification programs and conduct behavioral health-related research and evaluation projects to further support these efforts.

# Methodology

- The HPC used the Center for Health Information and Analysis (CHIA) Hospital Inpatient Discharge and ED Databases from 2012 to 2017 (10/1/2011- 9/30/2017) to report on opioid-related hospital discharges. Observation discharges were not included in this analysis (3,405 in 2016). Opioid-related discharges were identified using ICD-9 and ICD-10 diagnosis codes designated by the Agency for Healthcare Research and Quality, United States Department of Health and Human Services. Discharges with opioid-related diagnosis codes, primary or otherwise, were included in this analysis.
  - ICD-10 (after October 1, 2015) diagnosis codes included: F11 (opioid type dependence), excluding F11.21 (opioid dependence in remission), T400X1, T400X4 and T400X5 (poisoning by opium), T402X1, T402X4, T402X5 (poisoning by other opioids), T403X1, T403X4, T403X5 (poisoning by methadone), by heroin, opium (alkaloids), T404X1, T404X4, T404X5 (poisoning by other synthetic opioids), T406X1, T406X4, T406X5 (poisoning by unspecified opioids), T40961, T40694, and T40695 (poisoning by other narcotics).
  - ICD-9 (before October 1, 2015) diagnosis codes included\*: 30400, 30401, 30402, 30471, 30472, 30550, 30551, 30552 (opioid dependence codes), 96500 (poisoning by opium), 96501, E8500, E9350 (poisoning or adverse effects by heroin, 96509, E8502, E9542 (other opioids), 96502, E8501, and E9351 (poisoning by methadone).
- As with all analyses based on diagnosis codes, provider coding may not always accurately reflect a patient's clinical condition. In particular, heroin-related codes are considered specific but not necessarily sensitive. For example, some hospitals may use heroin-related codes rather than synthetic-opioid codes for all cases of poisoning/overdose, even though many overdoses include multiple substances including Fentanyl (a synthetic opioid). Because of such variation in coding across hospitals and the high incidence of claims that do not indicate specific substances, this report does not analyze specific substances.
- ICD-10 was implemented on October 1, 2015. This transition caused some discontinuity in trends, such that some of the increase between 2015 and 2016 may have been due to the change in the diagnosis coding systems rather than changes in prevalence or care delivery. While this was most apparent in substance exposed newborn analyses, it was also true for opioid-related analyses on adults.
- From 2011 to 2014, the CHIA databases included only the patient's first 15 diagnosis codes. However, as of 2015 all of a patient's diagnosis codes are included. While the additional codes made no difference in counts of ED visits, an additional 1,412 inpatient stays with opioid-related secondary diagnoses were counted in 2015 due to the expansion of diagnoses codes available in the data. Each year, reporting additional diagnoses beyond the first 15 codes increases. In 2017, 2,668 more cases were counted using all diagnoses as compared to when than limiting to 15 diagnoses. In prior reporting, the HPC included only the first 15 diagnoses to make data comparable year over year. Since this report focuses on recent years, analyses include all recorded diagnoses. Secondary diagnoses are not listed with any clinical prioritization in the discharge data sets, so selecting only the first 15 does not select the most relevant among the 15 secondary diagnoses. Comparisons across data from prior to 2015 and current hospital inpatient data should be done conscientiously.
- All discharges in from acute care hospitals and EDs were included regardless of discharge status, so data throughout this chartpack include patients who died.