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December 5, 2019

Steven T. James
House Clerk
State House Room 145
Boston, MA 02133

Michael D. Hurley
Senate Clerk
State House Room 335
Boston, MA 02133

Dear Mr. Clerk,

Pursuant to Chapter 111 Section 237 authorizing and requiring ongoing analysis of population health trends, prioritizing opioid overdose, and the establishment of the Public Health Data Warehouse, please find enclosed a report from the Department of Public Health titled, "Impact of the Opioid Epidemic on High Risk Populations and Maternal Health: Results from the Public Health Data Warehouse."

Sincerely,

Monica Bharel
Commissioner
Department of Public Health

Monica Bharel, MD, MPH

Charles D. Baker
Governor

Karyn Polito
Lieutenant Governor



Marylou Sudders
Secretary

Monica Bharel, MD, MPH
Commissioner

Impact of the Opioid Epidemic on High Risk Populations and Maternal Health: Results from the Public Health Data Warehouse

December 2019



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Legislative Mandate

The following report is hereby issued pursuant to Chapter 111 Section 237 of the General Laws as follows:

Section 237. The commissioner shall collect, record and analyze data, and shall assemble and maintain data systems, necessary to analyze population health trends. The commissioner shall give priority to analyzing fatal and nonfatal opiate overdoses. The commissioner may identify and determine additional priorities for the reduction of morbidity and mortality.

Notwithstanding [section 74 of chapter 6](#), sections 16 to 16Y, inclusive, of [chapter 6A](#), [chapter 12C](#), [chapter 19A](#), [chapter 46](#), [chapter 94C](#), [chapters 111](#) to 111O, inclusive, [chapter 112](#), [chapter 118E](#), [chapter 119](#), [chapter 120](#), [chapter 123](#), and [chapter 123B](#), the center for health information analysis and any office or agency within the executive branch shall provide, upon request from the commissioner, information necessary to conduct the analysis required by this section if the provision of such information is otherwise consistent with federal and state law. The commissioner may request from any office or agency within the judicial branch, and any such office or agency may provide, information necessary to conduct this analysis required by this section if the provision of such information is otherwise consistent with federal and state law.

The commissioner shall develop policies and procedures for the governance of such data and data systems, which shall include provisions for confidentiality and security. Information or data provided or accessed under this section shall be confidential, shall not be used to identify any individual and shall be used solely for the conduct of analysis pursuant to this section. Such information or data shall not be considered a public record, shall be exempt from disclosure under [section 10 of chapter 66](#) and shall not be subject to subpoena or discovery or admissible as evidence in any action of any kind in any court or before any other tribunal, board, agency or person. All resulting reports shall provide data in an aggregate and de-identified format.

The commissioner shall, not less than biennially, prepare and submit a report on priority public health trends. The report shall be publicly available and shall be filed with clerks of the senate and the house of representatives, the house and senate chairs of the joint committee on mental health, substance use and recovery, the house and senate chairs of the joint committee on public health and the house and senate chairs of the joint committee on health care financing.

The commissioner may promulgate regulations to implement this section.

Executive Summary

The opioid-related overdose death rate in Massachusetts has started to decline in recent years, falling an estimated 4% between 2016 and 2018 according to the latest quarterly opioid [report](#) released by the Massachusetts Department of Public Health. For the first six months of 2019, preliminary data reflects an 11% decline over the same period in 2018.

The Public Health Data warehouse (PHD), which combined individual-level data across 16 state data sources and 5 community level datasets, has been instrumental for generating insight not available from one data source alone. The PHD contains person-specific information about events such as prescriptions, drug treatment visits, hospital and emergency department visits, ambulance trips, insurance claims, history of incarceration, history of housing instability, and opioid-related overdose deaths. Being able to provide Massachusetts-relevant insights is a powerful tool in creating a fact-based approach to fighting the crisis.

Contained within this report are important findings about the profile of people who experience fatal and non-fatal opioid overdoses and the relative risks faced by the Commonwealth's diverse populations. The following population groups emerged from previous PHD [reports](#) as having characteristics and conditions that put them at elevated risk for opioid overdose: communities of color, people released from incarceration, people experiencing homelessness or housing instability, people with co-occurring substance use and mental health diagnoses, and pregnant and postpartum women. This report also provides further evidence of the effectiveness of medication for opioid use disorder (MOUD) and the need to increase access to MOUD especially within high risk groups.

Accurate and detailed data analysis of the opioid crisis in Massachusetts is critical to ensuring appropriate allocation of resources and access to care. We present this report so approaches to end the epidemic can be targeted effectively.

Background

Over 10,000 Massachusetts residents have died of opioid-related overdoses since 2013. The characteristics of the epidemic in Massachusetts are like other states -- crossing categories of race, class, gender and geography. While most every community in Massachusetts has been impacted, certain groups have been hit especially hard. Overall, opioid-related overdose deaths and nonfatal opioid-related overdoses are highest among younger males, but many other demographically-defined population groups have experienced increases in recent years. Individuals released from incarceration are at especially high risk of death upon re-entering the community, and individuals experiencing homelessness, mothers with opioid use disorder, and individuals with serious mental illness are also at high risk of death.

National rates of opioid use disorder (OUD) and opioid-related overdoses have increased dramatically since 2000.^{1,2} Massachusetts is particularly affected by opioids and opioid addiction.^{3,4,5} Massachusetts, as well as the U.S., is suffering a triple wave epidemic of overdose deaths from prescription opioid pills, heroin, and synthetic opioids.⁶ In the first wave, overdoses related to opioid prescriptions, started rising in 2000. The second wave saw overdose deaths due to heroin, which started increasing in 2007. The third wave of mortality has arisen from fentanyl, fentanyl analogues, and other synthetic opioids of illicit supply, climbing slowly at first, but dramatically after 2013. In addition to overdose, OUD puts people at risk of developing other health and social problems such as HIV and hepatitis C (HCV), cirrhosis, cognitive decline, family disintegration, domestic violence, and criminal behavior.⁷

Accurate estimates of OUD prevalence are important to ensure appropriate resource allocation and access to care. Though OUD prevalence has increased in Massachusetts, previous estimates were derived only from persons who were engaged in some level of care.^{4,8} However, a proportion of this population are not in contact with services at any one point in time,⁹ therefore, this prevalence is likely underestimated. To more accurately estimate the prevalence of OUD in Massachusetts from 2011-2015, we performed a capture-recapture analysis using data from the Public Health Data (PHD) Warehouse from 2011-2015. Using new methodology and the rich data from the PHD Warehouse, we estimated that approximately 4.4% of Massachusetts residents age 11 and older had an OUD in 2015, nearly four times higher than previous national prevalence estimates. The prevalence of OUD in Massachusetts among persons ages 11 and older increased from 2.72% in 2011 to 4.27% in 2015.

The opioid-related overdose death rate in Massachusetts has started to decline in recent years, falling an estimated 4% between 2016 and 2018 according to the latest quarterly opioid [report](#) released by the MDPH. For the first six months of 2019, preliminary data shows 497 confirmed and estimated opioid-related overdose deaths. This reflects an 11% decline over the same period in 2018.

Contained within this report are descriptions of analyses providing the state with important insights into the profile of overdose-related deaths and nonfatal opioid-related overdoses and the relative risks faced by the Commonwealth's diverse populations. This report is divided into two sections:

¹ Behavioral health trends in the United States: Results from the 2014 National Survey on Drug Use and Health. Substance Abuse and Mental Health Services Administration; 2015.

² Rudd RA, Aleshire N, Zibbell JE, Gladden RM. Increases in Drug and Opioid Overdose Deaths--United States, 2000-2014. *MMWR Morb Mortal Wkly Rep.* 2016;64(50-51):1378-82.

³ Data Brief: An Assessment of Opioid-Related Deaths in Massachusetts 2013-2014. Massachusetts Department of Public Health; 2016.

⁴ <https://www.mass.gov/lists/current-opioid-statistics>.

⁵ <https://www.mass.gov/service-details/chapter-55-overdose-report>

⁶ Ciccarone, D. Fentanyl in the US heroin supply: A rapidly changing risk environment. *The International Journal of Drug Policy*, 46, 107–111. <https://doi.org/10.1016/j.drugpo.2017.06.010>.

⁷ American Psychiatric Association., American Psychiatric Association. *DSM-5 Task Force. Diagnostic and statistical manual of mental disorders : DSM-5*. 5th ed. Washington, D.C.: American Psychiatric Association; 2013. xlv, 947 p. p.

⁸ Key substance use and mental health indicators in the United States: Results from the 2015 National Survey on drug use and health.: Substance Abuse and Mental Health Services Administration; 2016.

⁹ Wu LT, Zhu H, Swartz MS. Treatment utilization among persons with opioid use disorder in the United States. *Drug Alcohol Depend.* 2016;169:117-27.

1. **Populations at high risk:** In-depth analysis of populations at high risk and specific risk factors for OUD and opioid overdoses.
2. **Medications for Opioid Use Disorder (MOUD):** A synthesis of the results from various analyses that have looked at MOUD across populations.

The Public Health Data Warehouse (PHD) was established in 2017 through legislation which authorized and required ongoing analysis of population health trends to guide policy development and programmatic decision-making in the Commonwealth. The new law enabled linkage and analysis of data from more than 20 governmental administrative data systems to track trends in fatal and nonfatal opioid overdoses and other public health topics as prioritized by the Commissioner of the Massachusetts Department of Public Health (MDPH).¹⁰ Preceding the establishment of PHD, the passage of Chapter 55 of the Acts of 2015 by the Massachusetts Legislature and signed by Governor Charles D. Baker, and its re-authorization in Chapter 133 of the Acts of 2016, enabled MDPH to demonstrate the value of this innovative linked data approach. The “Chapter 55” findings, which are described in prior [reports](#), elucidated new information about the drivers and impacts of the opioid epidemic so action could be taken to prevent further morbidity and mortality from this devastating disease.

The PHD is a nationally recognized innovation, proven as an effective tool for accelerating data analysis and dissemination of actionable information to guide the Commonwealth’s response to the opioid crisis. While its initial focus was the study of fatal and non-fatal opioid overdoses, the PHD has been expanded to include new data assets and more recent years of data, thereby enriching its utility for analysis of other emerging and persistent public health threats. Going forward, the analytic agenda for PHD will continue to focus on fatal and nonfatal opioid overdoses in addition to a new topical area of focus: maternal and child health (MCH).

MCH was identified as an MDPH priority following a data review which highlighted significant disparities and inequities in this area. Maternal mortality is a sentinel global indicator for monitoring maternal health and the general quality of reproductive health care. The World Health Organization (WHO) reports that maternal mortality rates have fallen globally by nearly 44% from 1990 to 2015; however, the maternal mortality rate has increased in the United States (U.S.). In 2015, the U.S. maternal mortality rate ranked 46th among 181 countries and one of the highest of developed countries. Maternal mortality is often described as the tip of the iceberg of adverse maternal outcomes and accounts for a small fraction of the burden of poor maternal health. For every maternal death, there are about 100 episodes of severe maternal morbidity (SMM) affecting more than 50,000 women in the U.S. annually. Recent research suggests that women with SMM after delivery are at increased risk of adverse events that extend into both the first six weeks and one year postpartum.¹¹

The MDPH Office of Population Health, in collaboration with the Bureau of Family Health and Nutrition, recently convened an internal workgroup with programmatic and data experts from across MDPH to

¹⁰ Administrative data refers to information collected primarily for administrative (not research) purposes.

¹¹ Schiff, DM, et al. Fatal and Nonfatal Overdose Among Pregnant and Postpartum Women in Massachusetts. *Obstetrics & Gynecology*. VOL. 132, NO. 2, AUGUST 2018.

work with public and private partners to study differential outcomes and risks relative to MCH in the Commonwealth. The following MCH topics will be examined using the PHD in three phases starting in late 2019:

- Maternal morbidity and mortality – Phase 1
- Preterm births and infant mortality – Phase 2
- Adolescent wellness and health – Phase 3

Section I. In-Depth Population and Subpopulation Analyses

Race/Ethnicity

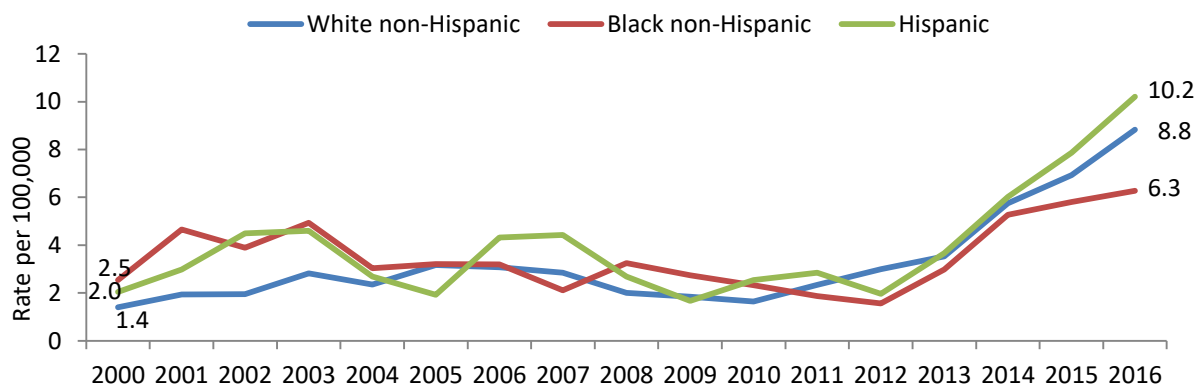
Background:

In 2000, the rate of opioid-related fatal overdose was 6.0 per 100,000 people in Massachusetts, according to DPH data. By 2015, there were 25.0 fatal opioid overdoses for every 100,000 residents.¹² While the majority of deaths are among non-Hispanic whites, the rate of death differs between racial and ethnic groups. Recent data have shown an overall decline in opioid-related overdose deaths except for black non-Hispanic men, which increased by 45% from 2016 to 2017.

Key Findings:

- Between 2014 and 2015, an overwhelming majority of the opioid-related overdose deaths had either stimulants or another drug in toxicology analysis at the time of death. Black non-Hispanic residents were 2.6 times more likely than white non-Hispanic residents to die with stimulants and opioids than opioids alone (OR: 2.65, 95% CI 1.23-5.7).
- The rate of overdose deaths involving stimulants and opioids was highest among Hispanic residents (10.2 per 100,000). The rate among Hispanics increased by nearly 50% per year from 2012 to 2016. The rate among white non-Hispanics increased a little over 30% per year from 2010-2015. While the annual rates were the lowest among black non-Hispanics, they also saw increased rates of nearly 40% per year from 2012-2016¹³(Figure 1).

Figure 1. Rate of Stimulants in Combination with Any Opioid by Race/Ethnicity, MA: 2000-2016



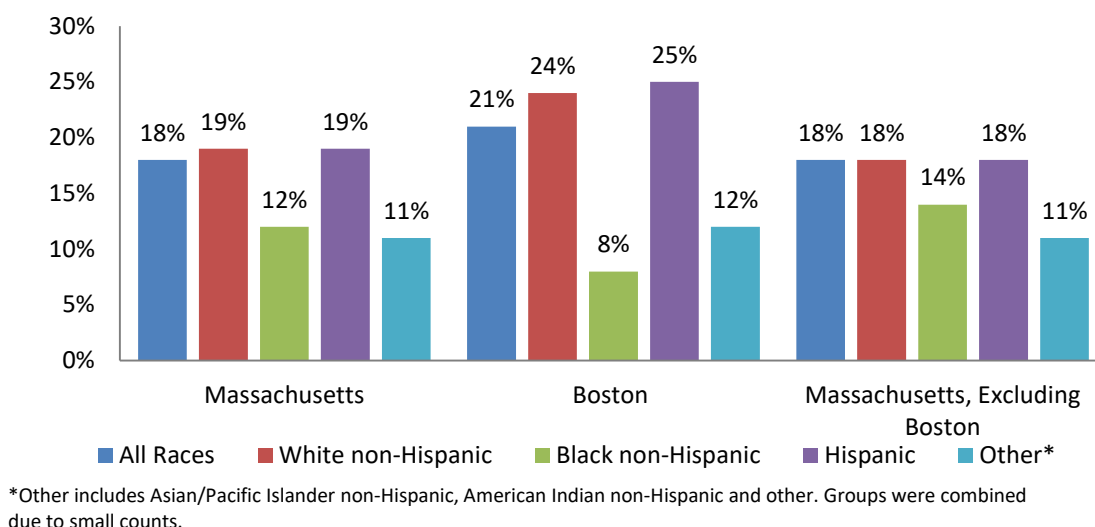
Notes: These deaths may include substances in addition to stimulants and opioids
Asian/Pacific Island non-Hispanic and Other non-Hispanic are not displayed due to small counts

¹² <https://www.mass.gov/files/documents/2019/05/15/Opioid-related-Overdose-Deaths-among-MA-Residents-May-2019.pdf>.

¹³ Data Brief: Stimulants, health disparities, and the impact of the opioid epidemic on maternal health and high risk populations. March 2019.

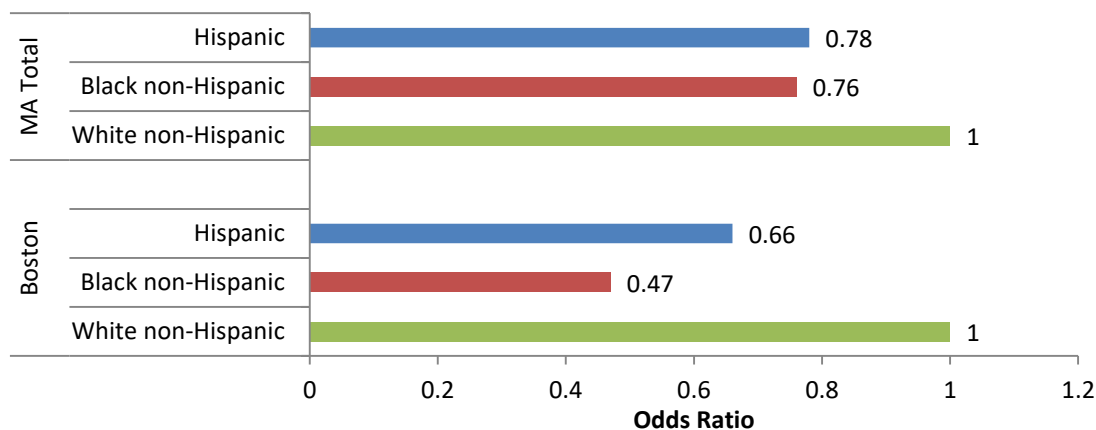
- Black non-Hispanic residents in Massachusetts, and in Boston specifically, were less likely to receive substance use treatment following hospital-related care for opioid overdose compared with White non-Hispanic residents (Figure 2).

Figure 2. Percentage of Hospital Patient Encounters for Opioid-Related Overdose Resulting in Substance Addiction Treatment in 30 Days, by Race/Ethnicity and Location, MA: 2011-2015



- Black non-Hispanic and Hispanic residents in Massachusetts were 24% and 22%, respectively, less likely to receive substance use disorder treatment within 30 days following hospital-related care for opioid overdoses than white non-Hispanic residents, while black non-Hispanic and Hispanic residents in Boston were 49% and 31%, respectively, less likely to received similar treatment compared with white non-Hispanic residents (Figure 3).

Figure 3. Odds of Receiving Subsequent Substance Use Disorder Treatment within 30 days Following a Hospital Patient Encounter for Opioid Overdose, MA: 2011-2015



- For more information on inequities in the SUD treatment cascade by race and Hispanic ethnicity, please see Section on People Already in Treatment on page 38.

Women

Background:

Opioid-related overdose deaths have more than quadrupled over the past 15 years, representing a public health emergency.^{14,15} [Previous findings](#) indicate that women are significantly more likely than men to receive Schedule II and III opioids from three or more prescribers and obtain them from three or more pharmacies. Obtaining Schedule II and III opioid prescriptions from multiple prescribers and filling them at multiple pharmacies are significant risk factors for subsequent opioid-related death. The rates of heroin use and prescription opioid-related overdose deaths are rising faster in women than in men, particularly women of reproductive age.^{16,17}

Opioid-related overdose has been identified as a major contributor to pregnancy-associated deaths (i.e. deaths during or in the year after pregnancy) nationally and in Massachusetts.¹⁸ Among all pregnancy associated deaths, 11-20% were the result of opioid overdose.^{19,20,21} Recent estimates of opioid use disorder (OUD) range from 0.4 to 0.8% during pregnancy to 2% among women of reproductive age.²² Pregnancy is often seen as a motivating time for women to reduce substance use and begin substance use treatment; however, the postpartum period can also be a stressful time when women are at increased risk of opioid overdose.^{23,24} There is a need for more information on subgroups of women who are most likely to experience an opioid-related overdose, to allow healthcare providers and policy makers to provide additional supports.

Key Findings: Overall Women

- Compared with all women who delivered a live birth and all women with evidence of Opioid Use Disorder (OUD) who had no overdose events, women with an overdose event were more likely to be white non-Hispanics: 87% of women with evidence of OUD and with an opioid overdose event were

¹⁴ O'Donnell JK, Gladden RM, Seth P. Trends in deaths involving heroin and synthetic opioids excluding methadone, and law enforcement drug product reports, by census region—United States, 2006–2015. *MMWR Morb Mortal Wkly Rep* 2017;66: 897–903.

¹⁵ Rudd RA, Seth P, David F, Scholl L. Increases in Drug and opioid-involved overdose deaths—United States, 2010–2015. *MMWR Morb Mortal Wkly Rep* 2016;65:1445–52.

¹⁶ Mack KA; Centers for Disease Control and Prevention (CDC). Drug-induced deaths—United States, 1999–2010. *MMWR Suppl* 2013;62:161–3.

¹⁷ Jones CM, Logan J, Gladden RM, Bohm MK. Vital signs: demographic, use substance. trends among heroin users— United States, 2002–2013. *MMWR Morb Mortal Wkly Rep* 2015;64:719–25.

¹⁸ Cicero TJ, Ellis MS, Surratt HL, Kurtz SP. The changing face of heroin use in the United States: a retrospective analysis of the past 50 years. *JAMA Psychiatry* 2014;71:821–6.

¹⁹ Maryland Department of Health and Mental Hygiene, Prevention and Health Promotion Administration. Maryland maternal mortality review: 2016 annual report. Annapolis (MD): Department of Health and Mental Hygiene; 2016.

²⁰ Virginia Department of Health, Office of the Chief Medical Examiner. Pregnancy-associated deaths from drug overdose in Virginia, 1999–2007: a report from the Virginia maternal mortality review team. Richmond (VA): Department of Health; 2015.

²¹ Metz TD, Rovner P, Hoffman MC, Allshouse AA, Beckwith KM, Binswanger IA. Maternal deaths from suicide and overdose in Colorado, 2004–2012. *Obstet Gynecol* 2016;128: 1233–40.

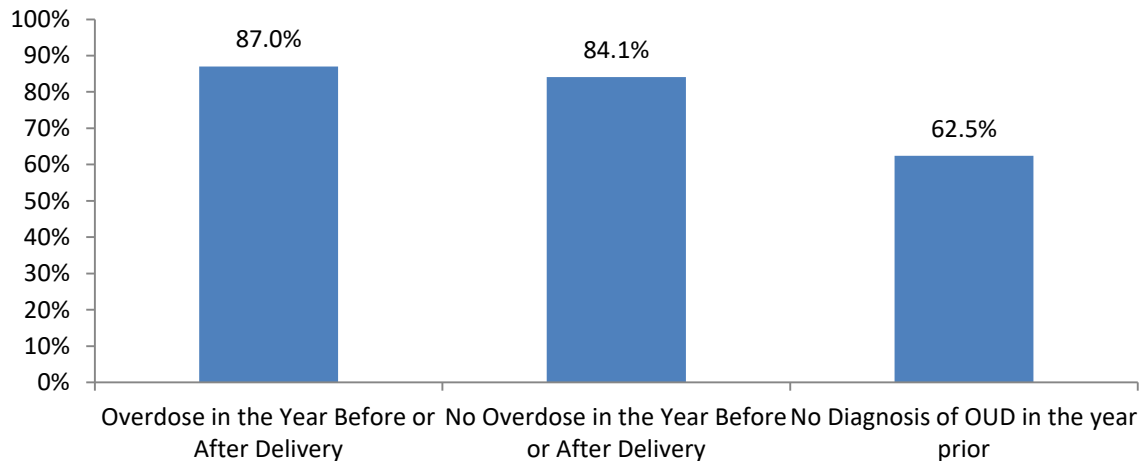
²² Kozhimannil KB, Graves AJ, Jarlenski M, Kennedy-Hendricks A, Gollust S, Barry CL. Non-medical opioid use and sources of opioids among pregnant and non-pregnant reproductive-aged women. *Drug Alcohol Depend* 2017;174:201–8.

²³ Forray A, Foster D. Substance use in the perinatal period. *Curr Psychiatry Rep* 2015;17:91.

²⁴ Forray A, Merry B, Lin H, Ruger JP, Yonkers KA. Perinatal substance use: a prospective evaluation of abstinence and relapse. *Drug Alcohol Depend* 2015;150:147–55.

white non-Hispanics compared with 62% of women who delivered a live birth without OUD²⁵ (Figure 4).

Figure 4. White non-Hispanic Mothers by Maternal Overdose Event During the 12 Months Before or After Delivery, MA: January 1, 2012 to September 30, 2014



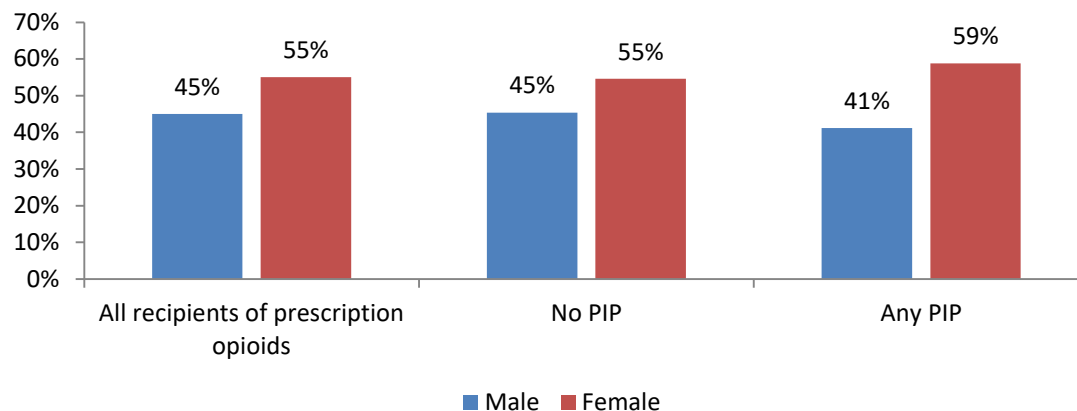
- Between 2014 and 2015, an overwhelming majority (almost 80%) of the opioid-related overdose deaths had either stimulants or another drug in toxicology analysis at the time of death. Women were almost 1.5 times more likely than men to overdose with a combination of opioids, stimulants, and another drug in their system than opioids alone (OR: 1.43, 95% CI: 1.06-1.93).
- Between 2012 and 2014, adolescents (ages 11-17) experiencing non-fatal opioid overdose were more likely to be female (52% vs. 38% of adults).²⁶
- Potentially inappropriate opioid prescribing (PIP) was more common among females from 2011 to 2015 (58.8% vs. 41.2% for males)²⁷ (Figure 5).

²⁵ Schiff, DM, et al. Fatal and Nonfatal Overdose Among Pregnant and Postpartum Women in Massachusetts. *Obstetrics & Gynecology*. VOL. 132, NO. 2, AUGUST 2018.

²⁶ Chatterjee, A, Larochelle, MR, et al. Non-fatal opioid-related overdoses among adolescents in Massachusetts 2012–2014. *Drug and Alcohol Dependence* 194 (2019) 28–31.

²⁷ Rose, AJ, et al. Potentially Inappropriate Opioid Prescribing, Overdose, and Mortality in Massachusetts, 2011–2015. *J Gen Intern Med*. June 2018.

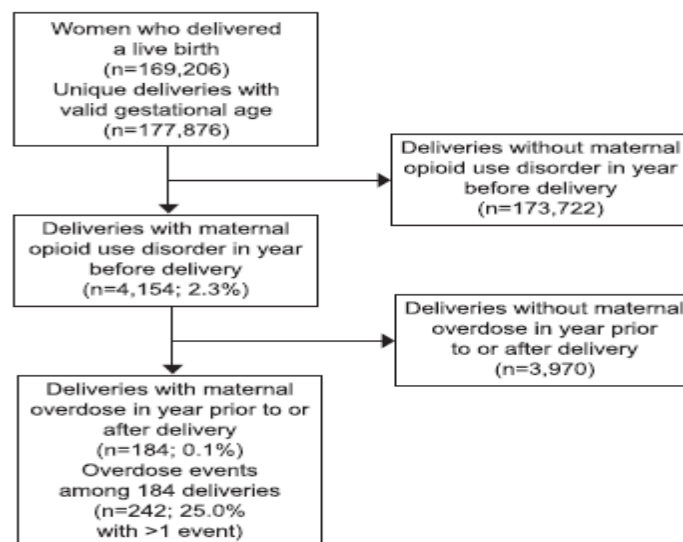
Figure 5. Gender Differences between Patients Receiving Any PIP vs. No PIP, Among Massachusetts Adults Who Received Prescribed Opioids at Least Once, MA: 2011-2015



Key Findings: Women Giving Birth²⁸

- Among women who had a live birth delivery and experienced a postpartum opioid overdose (OD), 58% experienced an opioid overdose more than 180 days following delivery.
- 3.9% of deliveries were to women with evidence of opioid use disorder (OUD) documented any time from 2011 to 2015 and 2.8% were to women with evidence of OUD in the year before or post-delivery.
- A total of 242 opioid overdose events (231 nonfatal and 11 fatal) occurred among 184 deliveries from January 2012 to September 2014. In 25% of those deliveries, a woman experienced multiple overdose events (up to 4) within the year before or after delivery (Figure 6).

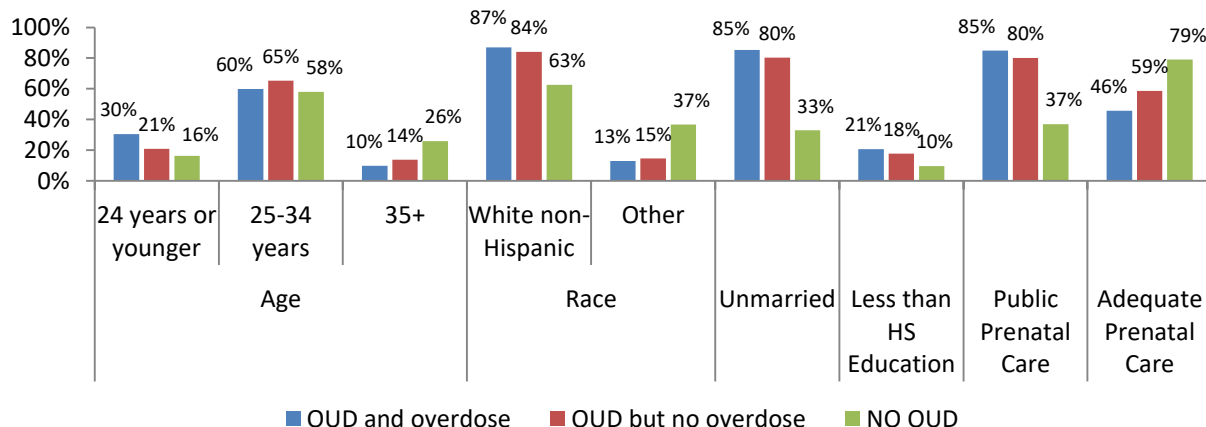
Figure 6. Cascade of Deliveries by Residents, MA: January 2012 to September 2014



²⁸ Schiff, DM, et al. Fatal and Nonfatal Overdose Among Pregnant and Postpartum Women in Massachusetts. *Obstetrics & Gynecology*. VOL. 132, NO. 2, AUGUST 2018.

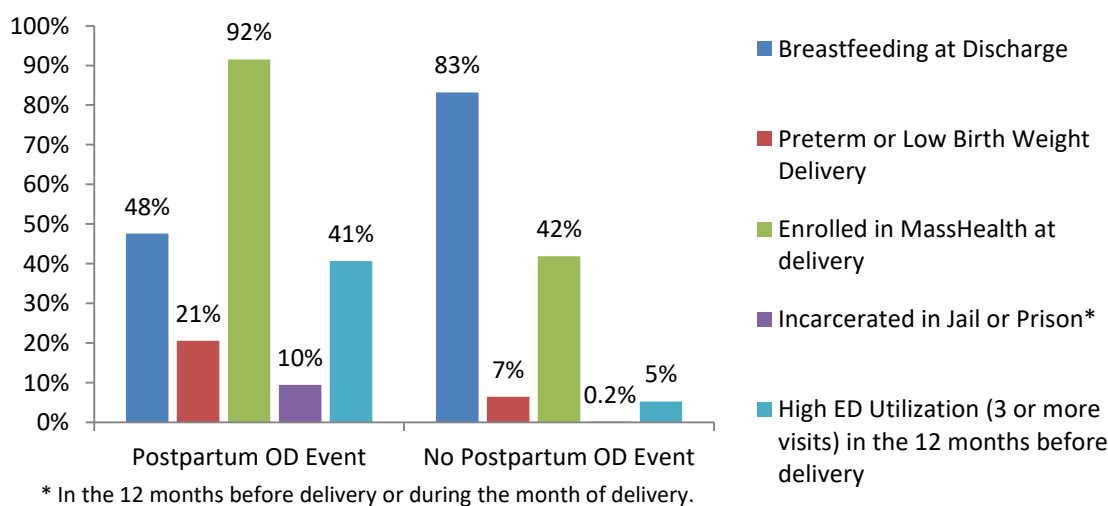
- Compared with women with evidence of OUD who had no opioid overdose events and all women who delivered a live birth, women with an opioid overdose event were more likely to be younger, single, unemployed, lacking a high school degree, receiving public insurance, and receiving inadequate prenatal care (Figure 7).

Figure 7. Characteristics of Deliveries, Stratified By Maternal Overdose Event During the 12 Months Before or After Delivery, MA: January 1, 2012 to September 30, 2014



- Women experiencing a postpartum OD were more likely to have public insurance (92% vs. 42%), deliver a preterm or low birth weight infant (20.6% v. 6.5%) as well as less likely to be breastfeeding at discharge (48% vs. 83%). In the 12 months before delivery, women experiencing a postpartum OD were more likely to have increased emergency department (ED) usage (41% vs. 5%) or be incarcerated (10% vs. 0%) (Figure 8).

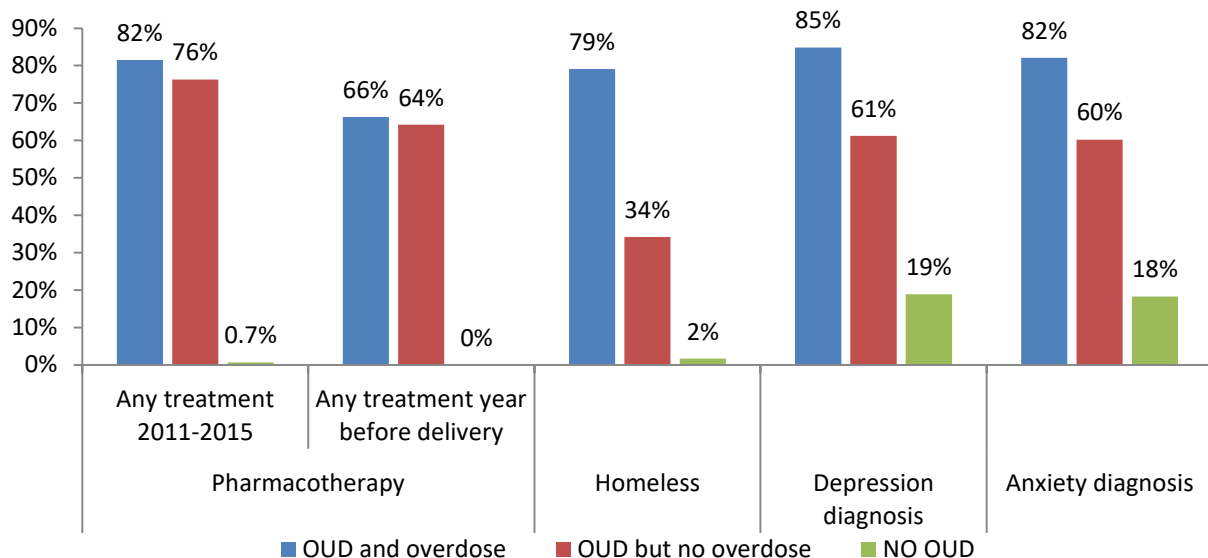
Figure 8. Characteristics of Deliveries, Stratified by Maternal Overdose Event During the 12 Months Before or After Delivery, MA: January 1, 2012 to September 30, 2014



- Women with an opioid overdose event had significantly higher co-occurring homelessness and psychiatric conditions: 79% of women with an opioid overdose event had some evidence of

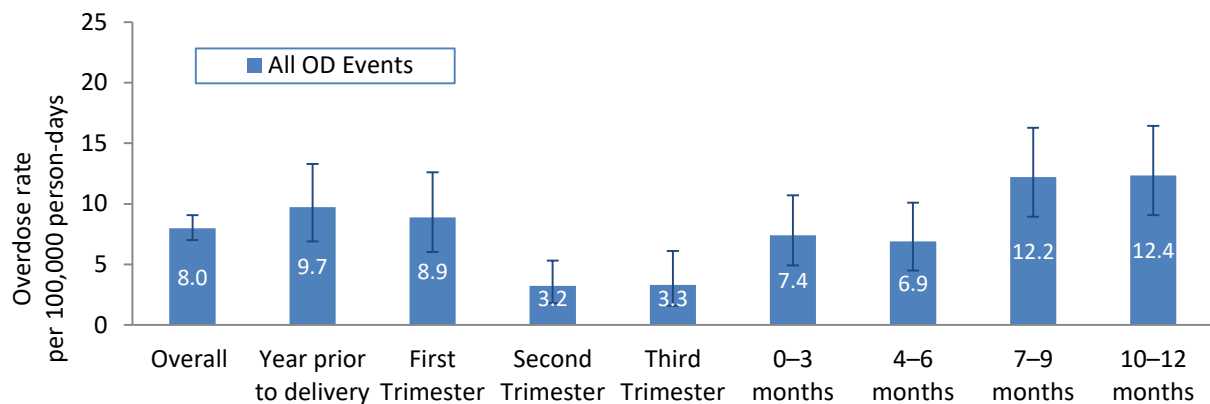
homelessness compared with 34% of women with OUD but no opioid overdose and 2% of women who delivered a live birth without OUD (Figure 9).

Figure 9. Characteristics of Deliveries, Stratified by Maternal Overdose Event During the 12 Months Before or After Delivery, MA: January 1, 2012 to September 30, 2014



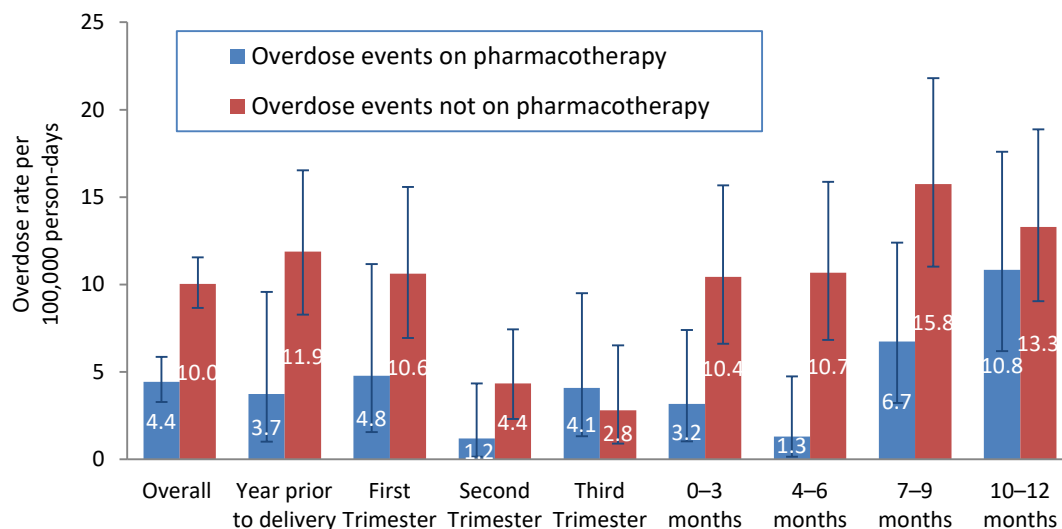
- Women with an opioid overdose event were significantly more likely to have evidence of anxiety (82% with overdose vs. 60% with OUD but no opioid overdose vs 18% of deliveries without OUD) and depression (85% with overdose vs 61% with OUD but no opioid overdose vs 19% of deliveries without OUD). And, overall, 64% of women with evidence of OUD who delivered babies received any pharmacotherapy in the year before delivery.
- The overall rate of opioid-related overdose events in the cohort was 8.0 per 100,000 person-days. Overdoses decreased as women progressed through pregnancy. They were lowest in the third trimester and then increased in the postpartum period. In the period from pregnancy to one year postpartum, the highest risk of overdose occurred 7-12 months after delivery, accounting for 58% of all overdoses during this period. (Figure 10).

Figure 10. Opioid Overdose Rates Among Pregnant and Parenting Women with Evidence of Opioid Use Disorder in the Year Before Delivery, MA: January 1, 2012 to September 30, 2014



- Overall, opioid overdose rates among women receiving pharmacotherapy²⁹ in the month of overdose were significantly lower compared with those not receiving pharmacotherapy. When comparing opioid overdose rates by receipt of pharmacotherapy, rates on treatment are lower than rates off treatment in every time period except the third trimester, when the number of events was low in both groups. Rates reached statistical significance 4-6 months post-delivery (1.3/100,000 person-days on pharmacotherapy [95% CI 0.16–4.74] vs 10.7/100,000 person-days for those not on pharmacotherapy [95% CI 6.84–15.88]. At 7-12 months postpartum, the opioid overdose rates increased for both women receiving pharmacotherapy and those not receiving treatment (Figure 11).

Figure 11. Overdose Events by Pharmacotherapy, MA: January 1, 2012 to September 30, 2014



²⁹ Monthly receipt of pharmacotherapy was determined based on evidence of 1) a claim for methadone maintenance (as described previously), 2) enrollment in a state-funded opioid treatment program receiving methadone, or 3) a filled prescription containing buprenorphine.

Criminal Justice-Inmates recently released from prisons/jails

Background:

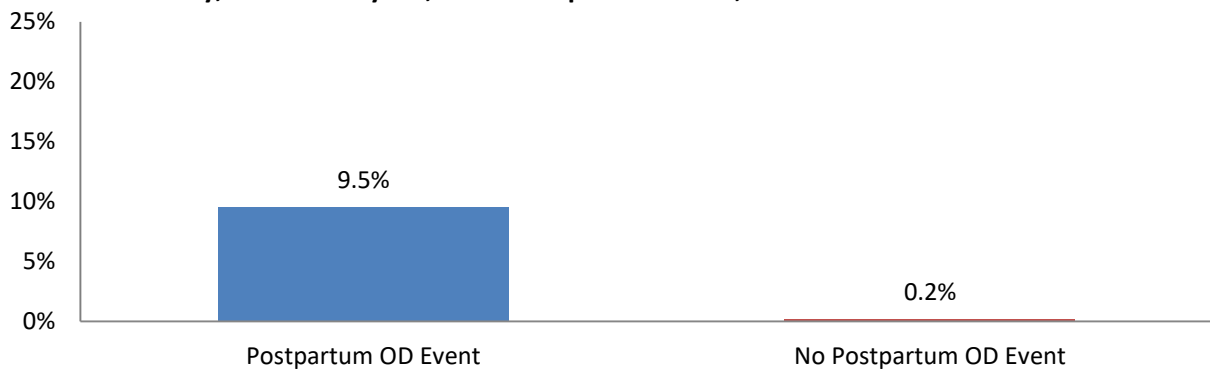
There is a large overlap between people involved in the criminal justice system and people who misuse substances. In a survey of State and Federal prisoners, the Department of Justice's (DOJ) Bureau of Justice Statistics (BJS) estimates that about half of the prisoners in the U.S. meet Diagnostic and Statistical Manual for Mental Disorders (DSM) criteria for substance use disorders, yet fewer than 20% who need treatment receive it.^{30,31} Of those surveyed, 14.8% of State and 17.4% of Federal prisoners reported having received drug treatment since admission.³²

Inmates released from correctional facilities are at an increased risk of overdose.³³ [Previous findings](#) concluded that individuals recently released from Massachusetts prisons were 56 times more likely to die from an opioid-related overdose. Many factors can contribute to this increased risk including that evidence-based, individualized treatment may not be available within the correctional facilities. In addition, due to prolonged abstinence and the resulting reduction in tolerance, a similar dose as the one used prior to incarceration may pose a significantly high risk of overdose. A large study conducted in Washington State found that within the first two weeks after release, the rate of death from overdose was 1,840 per 100,000 person-years, resulting in inmates being 129 times as likely to die of an overdose compared to other state residents during the first two weeks after release.³⁴

Key Findings:

- Women experiencing a postpartum opioid overdose were more likely to have been incarcerated in the 12 months before delivery or during the month of delivery (9.5% v. 0.2%) compared to women not experiencing a postpartum opioid overdoses (Figure 12).

Figure 12. Mothers Incarcerated in Jail or Prison in the 12 Months Before Delivery or During the Month of Delivery, MA: January 1st, 2012 to September 30th, 2014



³⁰ Chandler RK, et. Al. "Treating drug abuse and addiction in the criminal justice system: improving public health and safety." *Jama* 301.2 (2009): 183-190.

³¹ Mumola CJ, et. Al.. "Bureau of Justice Statistics special report." *Washington, DC: Department of Justice* (2006).

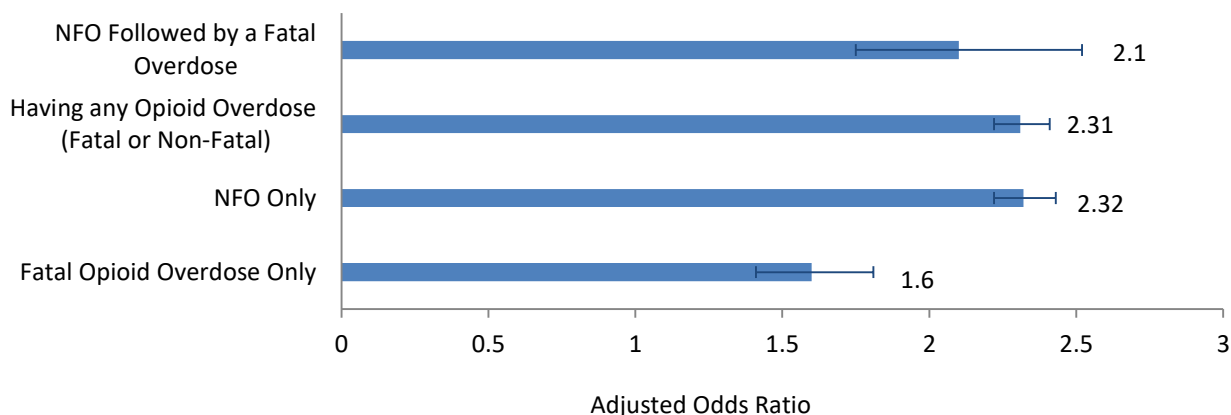
³² Ibid.

³³ Glaze L. E., Keuble D. *Correctional Populations in the United States, 2013*. Washington, DC: Bureau of Justice Statistics; 2014.

³⁴ Ingrid A. Binswanger, M.D., Marc F. Stern, M.D., Richard A. Deyo, M.D., Patrick J. Heagerty, Ph.D., Allen Cheadle, Ph.D., Joann G. Elmore, M.D., and Thomas D. Koepsell, M.D. Release from Prison – A High Risk of Death for Former Inmates. *N Engl J Med* 2007; 356:157-165 January 11, 2007. <http://www.nejm.org/doi/full/10.1056/nejmsa064115#t=articleTop>

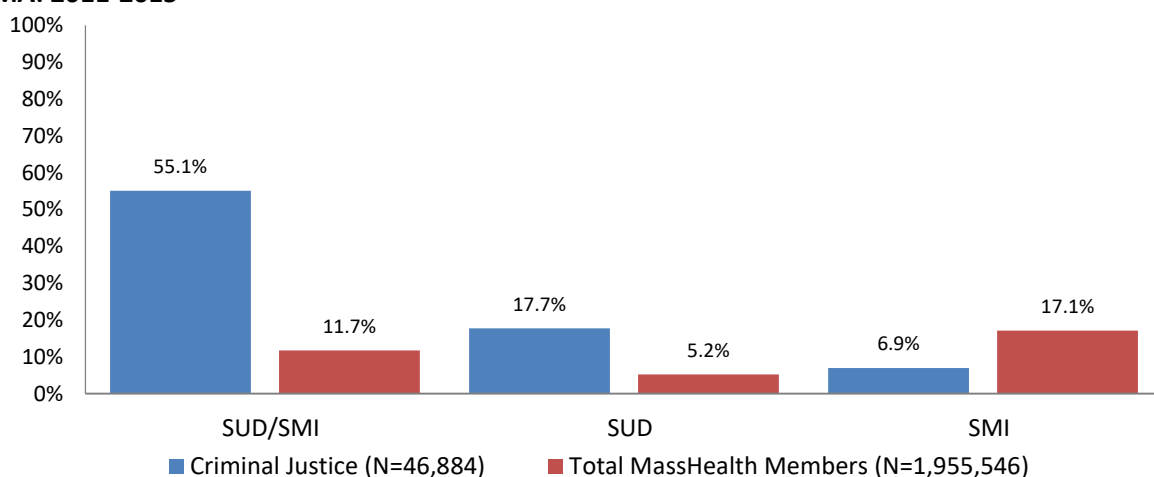
- Among MassHealth/Medicaid members, people recently released from incarceration had the high risk of both non-fatal and fatal opioid overdose, after adjusting for other risk factors. They were 60% more likely to have only a fatal opioid overdose, more than twice as likely to experience only a non-fatal opioid overdose, and twice as likely to have both a non-fatal and fatal opioid overdose.

Figure 13. Criminal Justice Involvement and Its Association with Opioid Overdoses, MA: 2011-2015



- Those recently released from prison/jails were five times more likely to have dual diagnoses of substance use disorders (SUD) and serious mental illness (SMI) than the general MassHealth population. This dual diagnosis is likely a key driver of the high opioid overdose prevalence among this cohort (Figure 14).

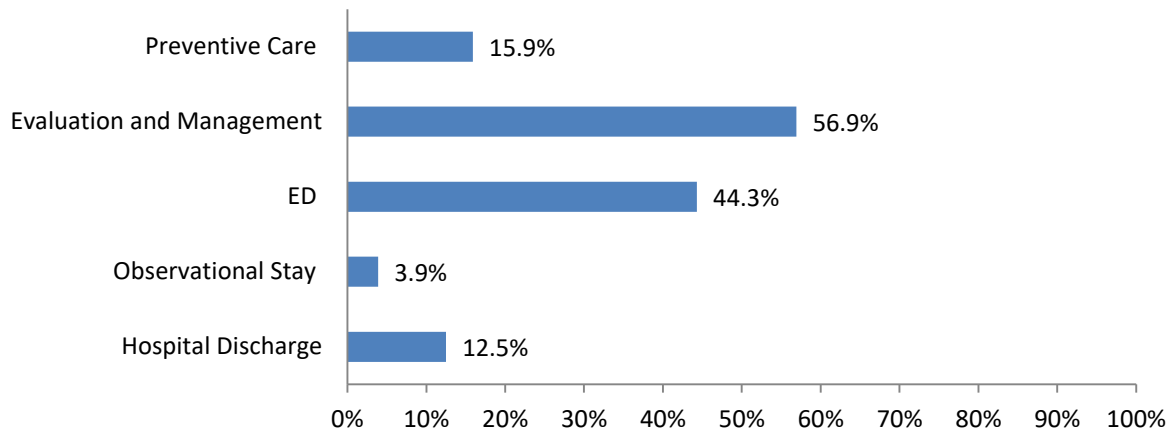
Figure 14. Distribution of Behavioral Health Diagnosis by Subpopulation of MassHealth, MA: 2011-2015



- Within a year following incarceration, more than 50% of MassHealth members had an outpatient visit for 'evaluation and management' and over 40% of members had an emergency department (ED) visit of which 13% were identified as substance-use related. Just

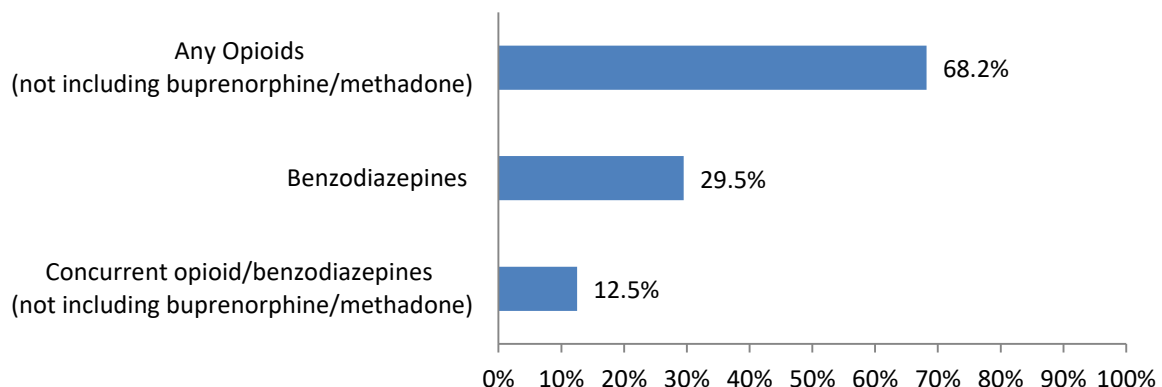
over one in ten members (13%) had an inpatient stay, with 9% of the hospital stays being substance-use related (Figure 15).

Figure 15. MassHealth Members, Ages 11-64, Who Received Selected Healthcare Services within Twelve Months Post-Release from Incarceration, MA: 2011-2015



- Within a year following incarceration, just over one in four (28%) MassHealth members had an outpatient behavioral health visit; inpatient behavioral health was less common (8%), as was medication for opioid use disorder (2%).
- Within a year following incarceration, prescriptions for any opioids were documented for over two-thirds (68%) of MassHealth members, while nearly one-third (30%) received a prescription for a benzodiazepine. Concurrent prescriptions for an opioid plus a benzodiazepine were noted for over one in ten (13%) MassHealth members in the 12 months immediately following release from incarceration (Figure 16).

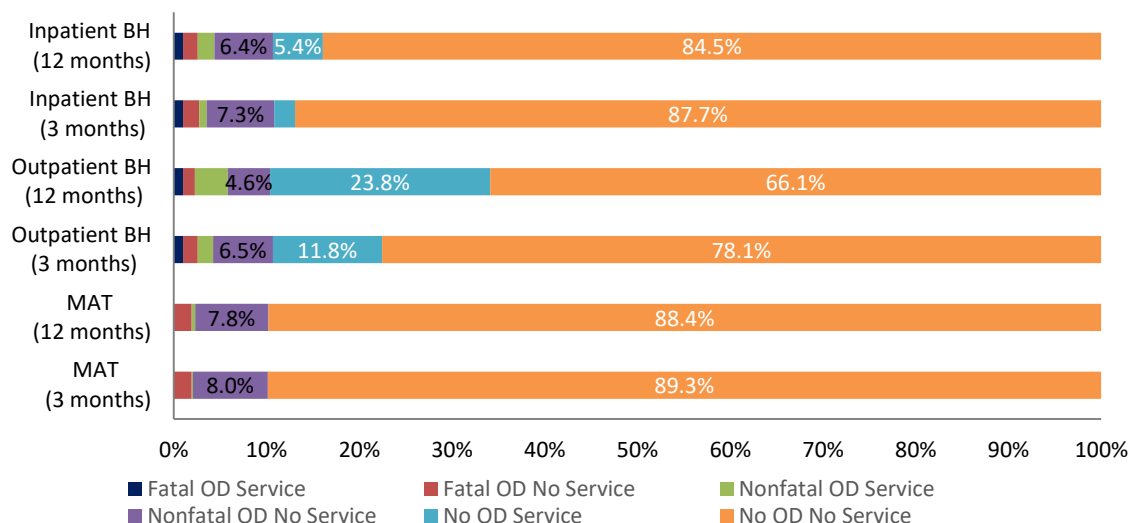
Figure 16. MassHealth Members with Prescriptions for Selected Controlled Substances within Twelve Months Post-Release from Incarceration (N=10,441), MA: 2011-2015



- While the percentage of MassHealth members who had a fatal opioid overdose after release from incarceration was minor across services (i.e., healthcare utilization [outpatient, ED, and

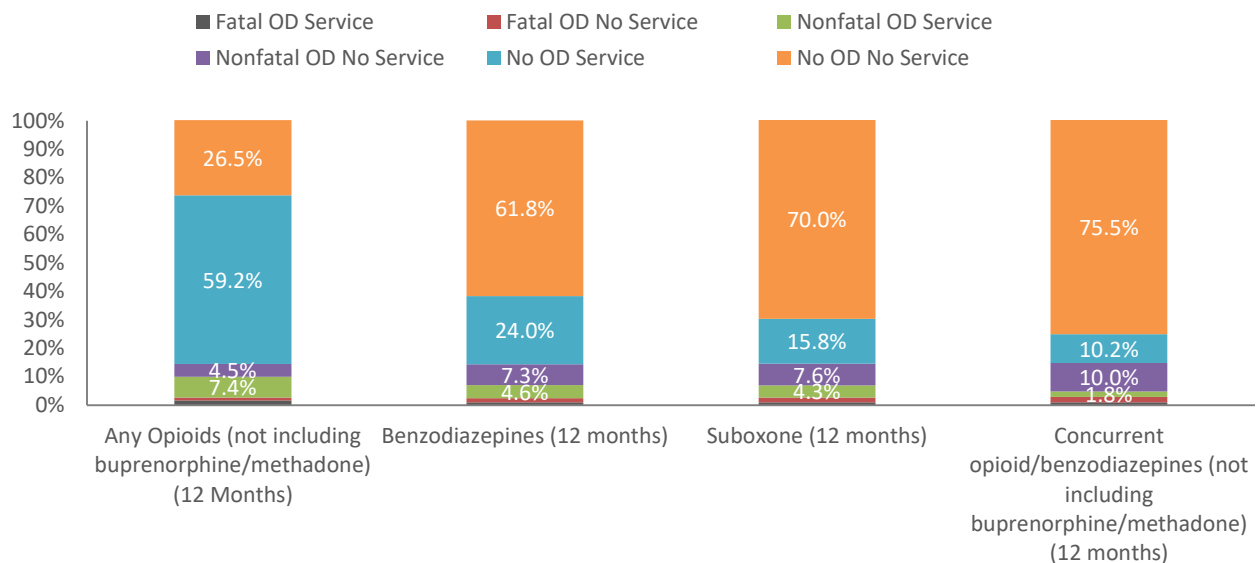
inpatient], behavioral health [outpatient, inpatient, and residential], and prescription drugs), the percentage of members who did not receive a service within either three or 12 months post-release was higher compared to those receiving any of these services (Figure 17).

Figure 17. Members who Received or Did Not Receive a MassHealth Behavioral Health Service Based on Overdose Outcome at 3 and 12 Months Post-Release from Incarceration, MA: 2011-2015



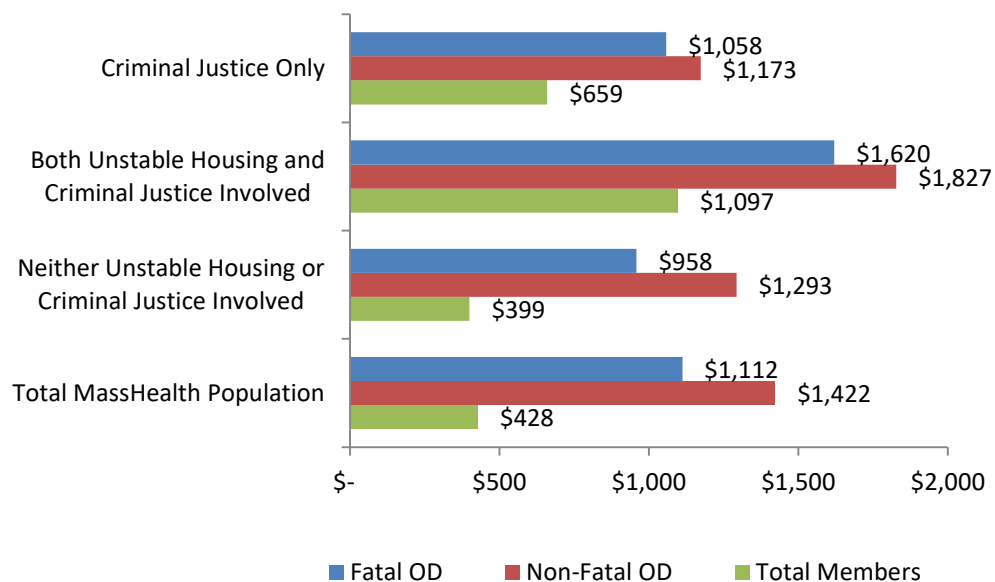
- Similarly, for MassHealth members having a non-fatal opioid overdose within the first year following release from incarceration, the percentage of members not receiving services was much higher (double in some instances) compared to those members who had at least one of these services. The notable exceptions to this pattern were among those who had ED visits, evaluation and management outpatient visits, or were prescribed any opioids after release from incarceration; whereby those with a non-fatal opioid overdose appear to be more likely to have received at least one of these services.
- Lastly, while the majority of MassHealth members had no opioid overdose after release from incarceration in the time frames presented (between 80-90%), relatively small percentages of members receive services. Services received predominantly included ED visits, evaluation and management outpatient visits, outpatient behavioral health visits, and prescriptions for opioids, benzodiazepines, and buprenorphine soon after release (Figure 18).

Figure 18. MassHealth Members with Prescriptions for Select Controlled Substances within Twelve Months Post-Release from Incarceration, MA: 2011-2015



- MassHealth members who were both unstably housed and criminal justice involved had Paid Claims Per Member Month (PMPM) costs for fatal and non-fatal opioid overdoses, which were 50-65% higher than the MassHealth population in general (Figure 19).

Figure 19. Average MassHealth PMPM by Opioid-Related Overdose Outcome, Ages 11-64 Years, MA: 2012-2015



- Between 2014 and 2015, an overwhelming majority of the opioid-related overdose deaths had either stimulants or another drug in toxicology results at the time of death. One exception was persons who were incarcerated in the 12 months preceding the opioid overdose; these persons were half as likely than those without incarceration between 2011-2015 to die of opioids with non-stimulant substances than with opioids alone (OR: 0.53, 95% CI: 0.36-0.79).
- For information on recently released veterans, please see Section on Veterans on page 31.

People Experiencing Homelessness

Background:

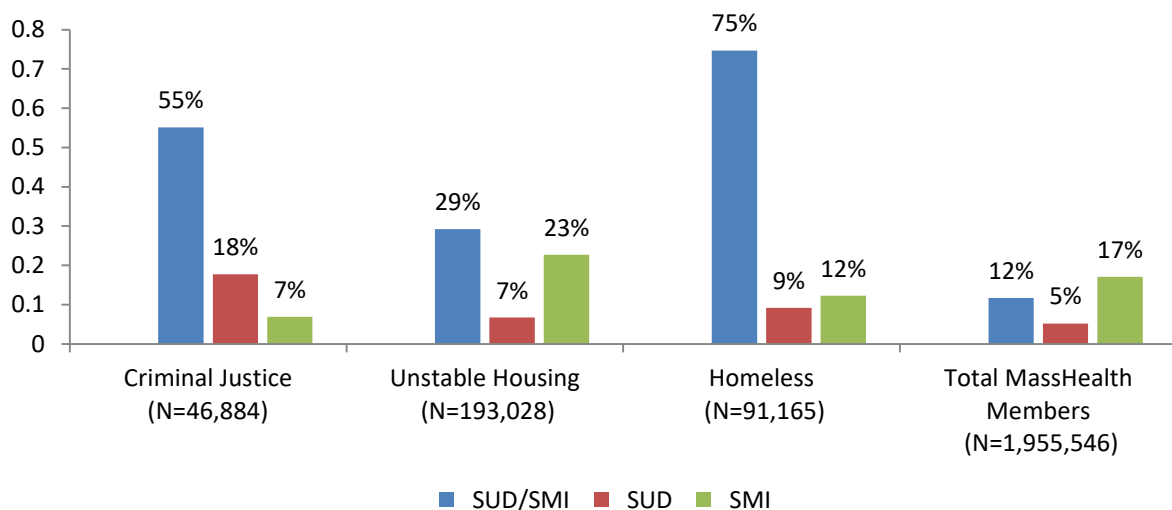
Several studies have found homelessness to be associated with a wide range of adverse health and social outcomes.³⁵⁻³⁶ Persons experiencing homelessness often interact with multiple publicly-funded systems of care including emergency shelter, health care, mental health, or substance use disorder treatment, and the criminal justice system, thus it is important to provide numerous options to address their housing, health care, and other social needs.^{37,38,39,40} Drug overdose is the leading cause of death among those experiencing homelessness in Massachusetts, and opioids are responsible for four out of five of these overdoses.

Key Findings:

Among MassHealth members:

- The proportion of members experiencing homelessness with a dual diagnosis of substance use disorders (SUD) and serious mental illness (SMI) was nearly seven times higher than in the total MassHealth population (Figure 20).

Figure 20. Distribution of Behavioral Health Diagnosis by Subpopulation of MassHealth Members Ages 11-64, MA: 2011-2015



³⁵ Hwang S. Homelessness and health. *Can Med Assoc J.* 2001;164(2):229-233.

³⁶ Fazel S, Geddes JR, Kushel M. The health of homeless people in high-income countries: descriptive epidemiology, health consequences, and clinical and policy recommendations. *Lancet.* 2014;384(9953):1529-1540. doi:10.1016/S0140-6736(14)61132-6.

³⁷ Hopper K, Jost J, Hay T, Welber S, Haugland G. Homelessness, severe mental illness, and the institutional circuit. *Psychiatr Serv.* 1997;48(5):659-665. doi:10.1176/ps.48.5.659.

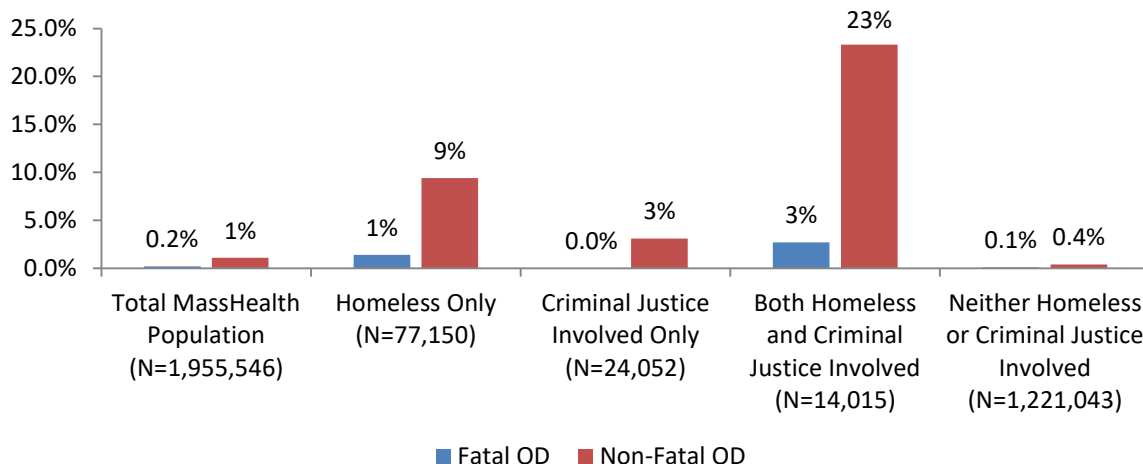
³⁸ Fuehrlein BS, Cowell AJ, Pollio D, Cupps L, Balfour ME, North CS. A prospective study of the associations among housing status and costs of services in a homeless population. *Psychiatr Serv.* 2015;66(1):27-32. doi:10.1176/appi.ps.201400010.

³⁹ Culhane DP, Metraux S, Hadley T. Public Service Reductions Associated with Placement of Homeless Persons with Severe Mental Illness in Supportive Housing. *Hous Policy Debate.* 2002;13(1):107-163.

⁴⁰ Flaming D, Burns P, Matsunaga M. *Where We Sleep: Costs When Homeless and Housed in Los Angeles.* Los Angeles, CA: Economic Roundtable; 2009.

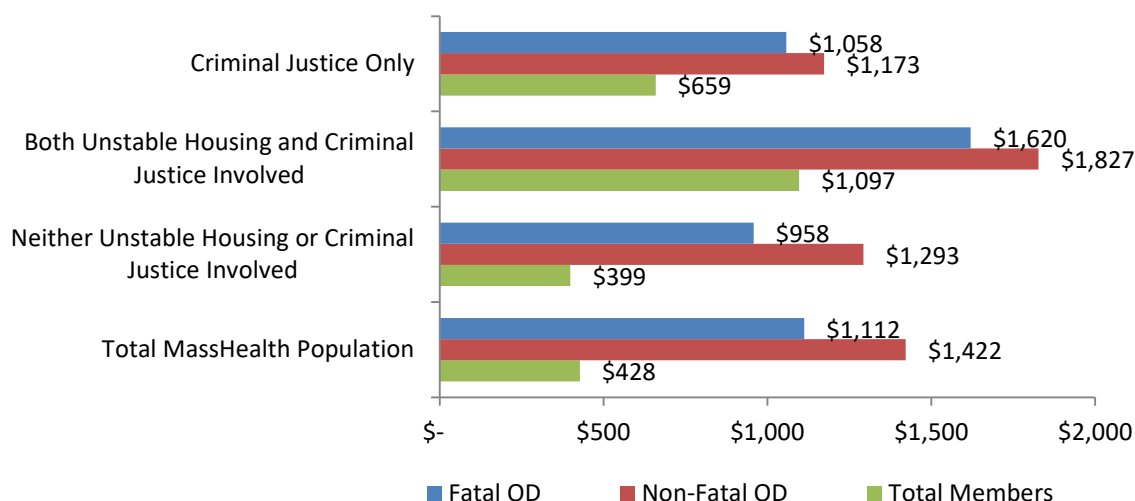
- Compared with MassHealth members in total, those experiencing homelessness had higher percentages of fatal opioid overdose and significantly more non-fatal opioid overdoses (9.4% vs. MassHealth total population: 1.1%). When coupled with those who have had prior engagement with the criminal justice system, the percent of non-fatal opioid overdoses more than doubles (23.3% vs. persons experiencing homelessness only: 9.4%) (Figure 21).

Figure 21. Fatal and Non-Fatal Opioid Overdoses Among Those Experiencing Homelessness and/or Criminal Justice Involvement, MA: 2011-2015



- MassHealth members who experienced homelessness had costs⁴¹ that were more than triple those of MassHealth members in general. MassHealth members who were both unstably housed and criminal justice involved had PMPM costs for fatal and non-fatal opioid overdoses which were 50-65% higher than the MassHealth population in general (Figure 22).

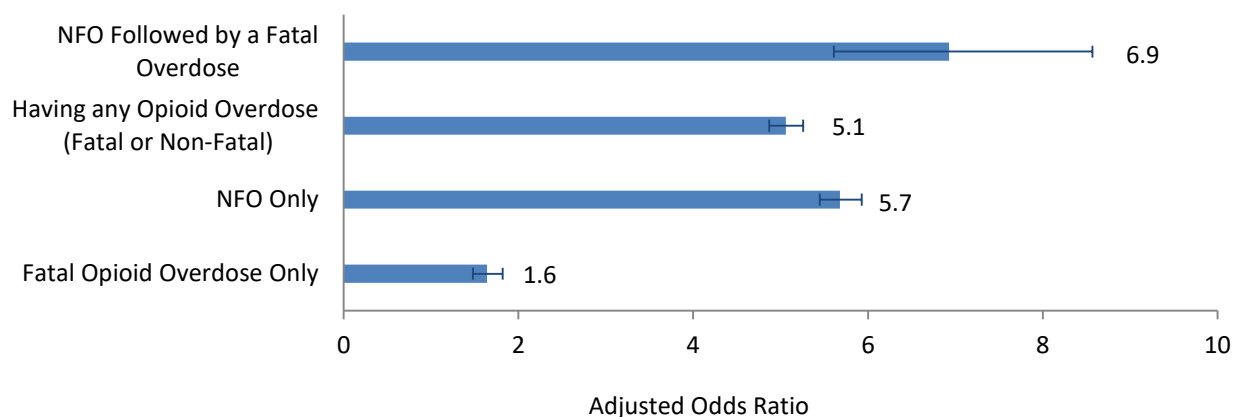
Figure 22. Paid Claims Per Member Per Month (PMPM) Among MassHealth Members Who Have Experienced Unstable Housing and/or Criminal Justice Involvement, MA: 2012-2015



⁴¹ Per member-per month (PMPM) costs.

- Those experiencing homelessness were 64% more likely to have a fatal opioid overdose, nearly six times more likely to experience a non-fatal opioid overdose, and nearly seven times more likely to have a non-fatal opioid overdose followed by a fatal opioid overdose, after adjusting for several behavioral health diagnoses, chronic medical conditions, demographic characteristics, and engagement with state agencies, (Figure 23).

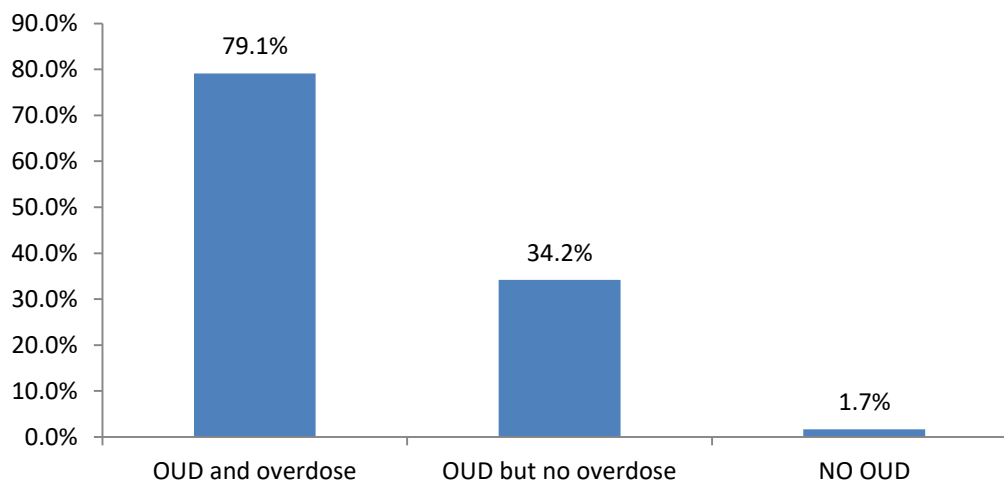
Figure 23. Homeless and Its Association with Opioid Overdoses, MA: 2011-2015



Adjusted for several behavioral health diagnoses (SUD, SMI, intentional self-harm), chronic medical conditions (HIV, HCV, CHF, hypertension, diabetes), demographic characteristics (age, gender, race) and engagement with state agencies

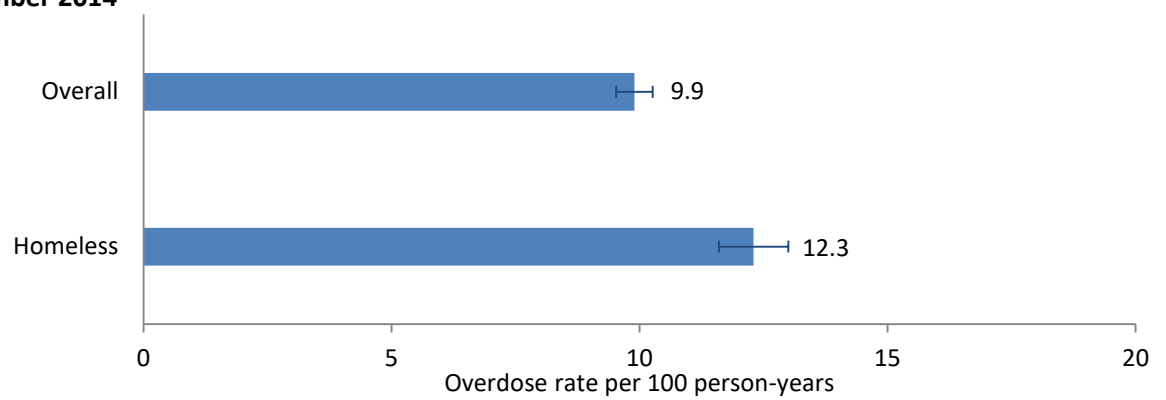
- For more information on veterans who had evidence of homelessness, please see Section on Veterans on page 31.
- Seventy-nine percent of women with an opioid overdose event had some evidence of homelessness compared with 34% of women with OUD but no opioid overdose and 2% of women who delivered a live birth without OUD (Figure 24).

Figure 24. Characteristics of Deliveries by Maternal Overdose Event During the 12 Months Before or After Delivery, MA: 2012-2014



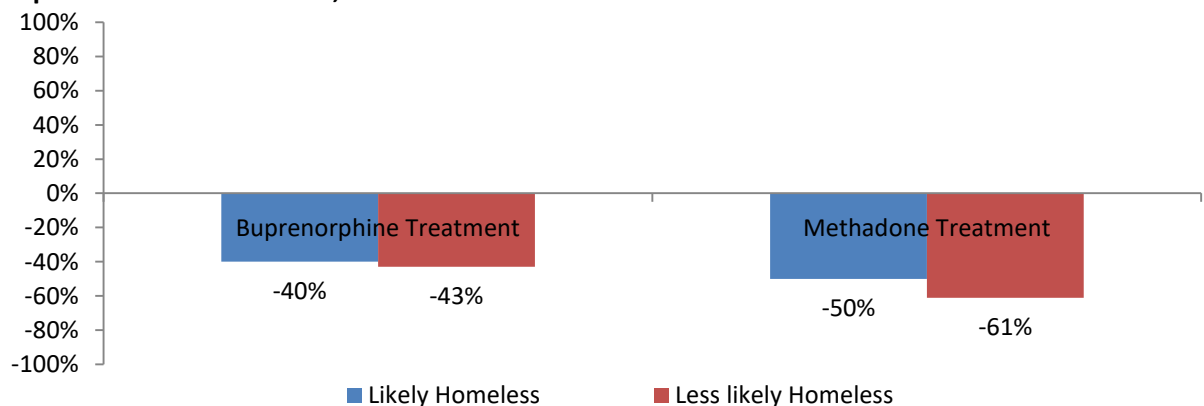
- Between 2014 and 2015, an overwhelming majority of the opioid-related overdose deaths had either stimulants or another drug in toxicology analysis at the time of death. Persons who experienced recent homelessness (homeless at any time between 2011 and 2015) were twice as likely to have died with stimulants and opioids as opioids alone.
- Inpatient treatment for substance use disorders has been standardized as a succession of steps – or “cascade” -- from acute detoxification to long- term residential care. Homeless individuals were at higher opioid overdose risk among individuals navigating the inpatient treatment cascade in Massachusetts (12.3 overdoses per 100 person-years) (Figure 25).

Figure 25. Overdose Among Populations in the Treatment Cascade, MA: January 2012 to September 2014



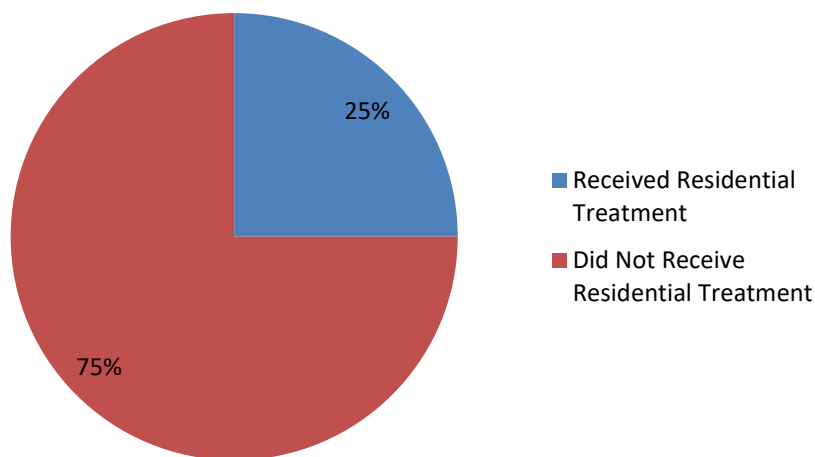
- Treatment with buprenorphine was associated with a 40% reduction in mortality among individuals with high-likelihood of having experienced homelessness and 43% reduction among those less likely to have been homeless. Methadone maintenance treatment was associated with a 50% and 61% reduction in mortality reduction respectively among those more likely and less likely to have experienced homelessness (Figure 26).

Figure 26. Reduction in Mortality by Receipt of Treatment and by Likelihood of Having Experienced Homelessness, MA: 2012-2014



- Only 25% of individuals with high likelihood of homelessness were served in a long-term residential facility. These data suggest increasing access to long-term care facilities may be particularly effective in reducing mortality for patients treated in inpatient detoxification units in Massachusetts.⁵²
- Among individuals with a high likelihood of homelessness, long-term residential opioid use disorder treatment was associated with a 48% reduction in mortality; however, only 25% of individuals with high likelihood of homelessness were treated in a long-term residential facility.⁵² (Figure 27).

Figure 27. Likelihood of Receiving Residential Treatment Among Those Highly Likely to Be Homeless, MA: 2011-2015



Adolescents

Background:

The opioid epidemic in the United States has not spared adolescents. Between 1993 and 2010, emergency department visits for opioid-related overdose increased 1188% for those younger than 20⁴² and annual opioid-related overdose deaths among 15-19 year-olds increased 2.3-fold from 1999 to 2015.⁴³ The percentage of opioid-related deaths by age groups in Massachusetts shows that the young are especially at risk. From 2013 to 2014, opioids accounted for more than a quarter of all fatalities in the 18-24 age group. For individuals from 25-34, opioids were responsible for more than a third of all deaths, rising to more than 40% for men. In 2015, roughly two out of every three people who died from opioids were younger than 45.

Key Findings:

- Between 2014 and 2015, an overwhelming majority of the opioid-related overdose deaths had either stimulants or another drug identified in toxicology analysis at the time of death. Persons in the age groups 25-44 and 45+ were nearly two times more likely than the youngest age group (11-24) to overdose with stimulants present in toxicology analysis than with opioids alone (odds ratio (OR): 1.84, 95% CI: 1.23-2.76, and OR 1.7, 95% CI: 1.10-2.64, respectively).²⁹
- Between 2012 and 2014, of the 22,506 individuals who experienced a non-fatal opioid overdose (NFOD), 0.9% (195) were 11-17: 27% were 11-14 and 73% were 15-17 years of age. Adolescents experiencing a NFOD were more likely to be female (52% vs. 38% of adults), more likely to have an address in a rural zip code (14% vs. 7% of adults), less likely to be enrolled in MassHealth (57% vs. 73% of adults), and less likely to have a diagnosis of anxiety (13% vs. 19% of adults) or depression (16% vs. 23% of adults).⁴⁴

Table 1. Characteristics of Individuals Experiencing Non-Fatal Opioid Overdose in Massachusetts Between 2012 and 2014, Adolescents Aged 11–17 Years vs. Adults > 18 Years

Characteristic	% (n) for Ages 11-17 N=195	% (n) for Ages 18+ N=22,311	P-Value
Female	52 (102)	38 (8461)	<0.001
Rural zip code	14 (27)	7 (1525)	<0.001
Enrolled in MassHealth	57 (111)	73 (16202)	<0.001
Diagnosis of Anxiety	13 (25)	19 (4251)	0.03
Diagnosis of Depression	16 (32)	23 (5196)	0.02

⁴² Hasegawa, K., Espinola, J.A., Brown, D.F.M., Camargo, C.A., 2014. Trends in U.S. Emergency department visits for opioid overdose, 1993–2010. *Pain Med.* 15, 1765–1770. <https://doi.org/10.1111/pme.12461>.

⁴³ Curtin, S., Tejada-Vera, B., Warner, M., 2017. Drug overdose deaths among adolescents aged 15–19 in the United States: 1999–2015. *NCHS Data Brief* 282, 1–8.

⁴⁴ Chatterjee, A. Larochelle, MR, et al. Non-fatal opioid-related overdoses among adolescents in Massachusetts 2012–2014. *Drug and Alcohol Dependence* 194 (2019) 28–31

- In addition, adolescents experiencing a NFOD between 2012 and 2014 were less likely to receive an opioid prescription in the 12 months preceding the NFOD (11% vs. 43% of adults). In the 12 months after a NFOD, 8% (15 of 195) of adolescents received any medications for opioid use disorder (MOUD), compared to 29% of adults.⁴⁵

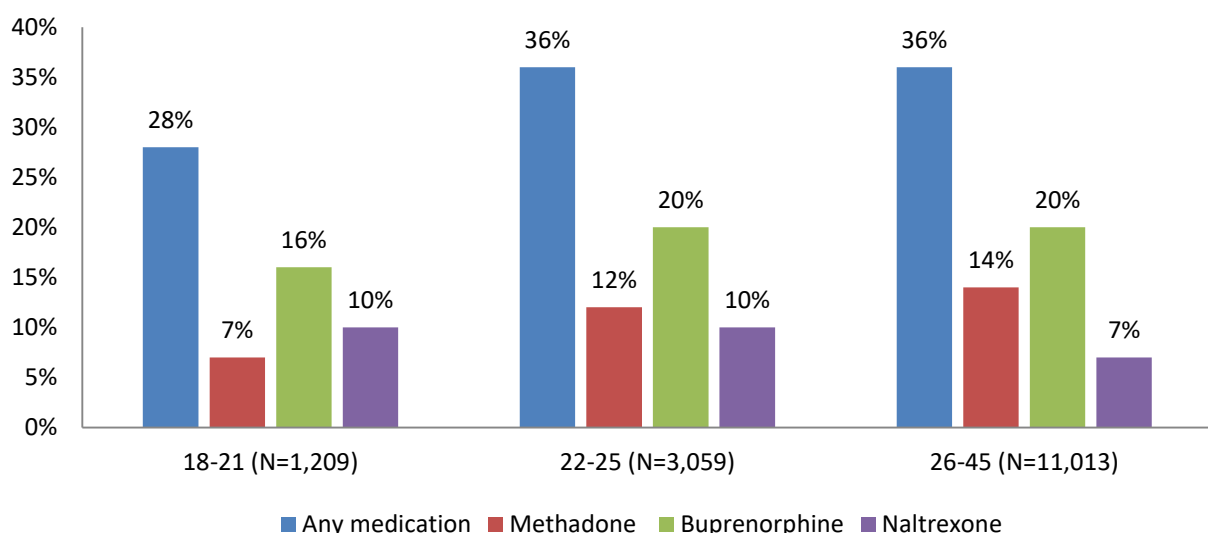
Table 2. Characteristics of Individuals Experiencing Non-Fatal Opioid Overdose in Massachusetts Between 2012 and 2014, Adolescents Aged 11–17 Years vs. Adults > 18 Years

Characteristic	% (n) for Ages 11-17 N=195	% (n) for Ages 18+ N=22,311	P- Value
Prescription for Opioids Prior 12 months	11 (21)	43 (9544)	<0.001
Prescription for Benzodiazepines Prior 12 months	5 (10)	29 (6454)	<0.001
Any Medication for OUD ^a Prior 12 months	<5 (< 10)	23 (5077)	<0.001
Prescription for Buprenorphine Prior 12 months	<5 (< 10)	11 (2548)	<0.001
Prescription for Naltrexone Prior 12 months	<5 (< 10)	4 (1002)	<0.001
Methadone Maintenance Prior 12 months	0 (0)	10 (2195)	<0.001
Any Medication for OUD ^a in the 12 months following NFOD ^b	8 (15)	29 (6472)	<0.001

^a OUD: Opioid Use Disorder
^b NFOD: Non-Fatal Overdose

- Analysis shows that 18-21 year olds were the least likely to receive any MOUD overall and less likely to receive methadone or buprenorphine, specifically, in the 12 months following nonfatal opioid overdose. They were the most likely to receive naltrexone (Figure 28).

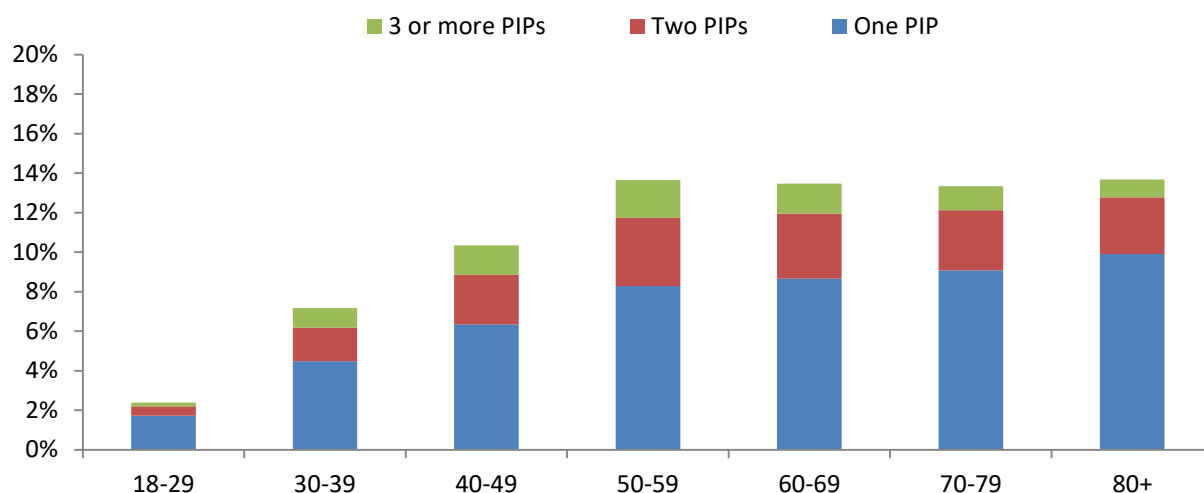
Figure 28. Receipt of Medication Treatment in 12 Months Following a Non-Fatal Overdose Stratified by Age Groups, MA: 2012-2014



⁴⁵ Chatterjee, A, et al. Non-fatal opioid-related overdoses among adolescents in Massachusetts 2012–2014. Drug and Alcohol Dependence 194 (2019) 28–31.

- Compared with women with evidence of OUD who had no opioid overdose events and all women who delivered a live birth, women with an opioid overdose event were more likely to be younger: 30% of women with an opioid overdose event were ages 24 and under compared with 21% of women with OUD but no opioid overdose and 16% of women who delivered a live birth without OUD.⁴⁶
- Inpatient treatment for substance use disorders has been standardized as a succession of steps—or “cascade” -- from acute detoxification to long- term residential care. Populations along the inpatient cascade of care at higher opioid overdose risk included emerging adults aged 18 to 29 (11.0 overdoses per 100 person-years).
- The rate of any potentially inappropriate prescribing (PIP) increased with age, from 2% of individuals ages 18 to 29 to 14% of those aged 50 and older⁴⁷ (Figure 29).

Figure 29. Age-Specific Percentages of Adult Prescription Opioid Recipients by PIP, MA: 2011-2015

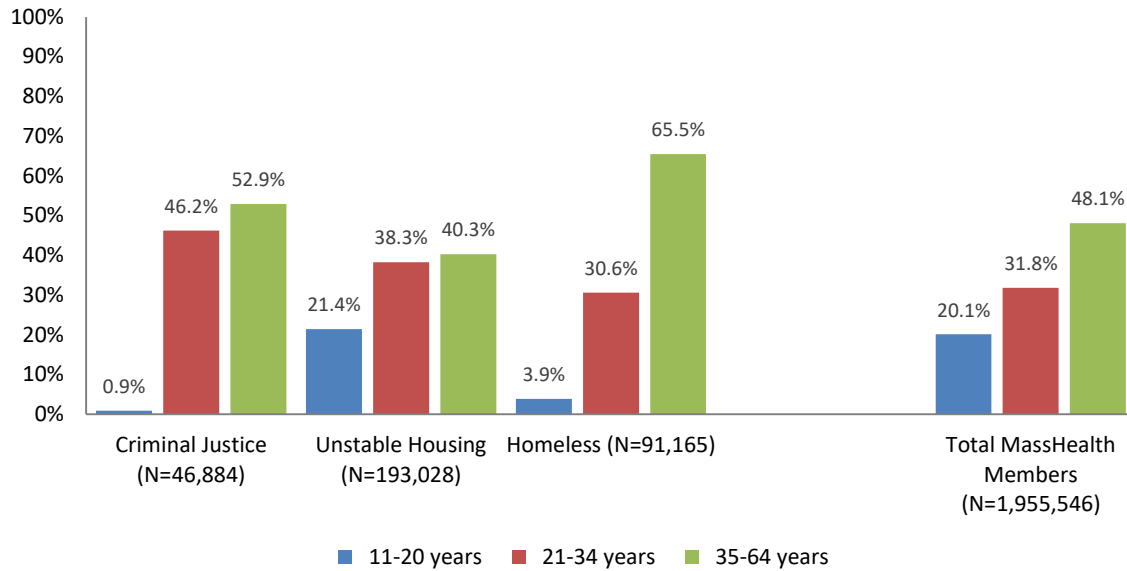


- While the majority of the total MassHealth population were adults, the criminal justice involved population had proportionately more persons in the ‘young adult’ (21-34 years) age group. MassHealth members with unstable housing were more likely to be 11 to 20 years compared to the other two high-risk populations (homeless and criminal justice involved), in a similar proportion to the overall MassHealth membership (Figure 30).

⁴⁶ Schiff, DM, et al. Fatal and Nonfatal Overdose Among Pregnant and Postpartum Women in Massachusetts. *Obstetrics & Gynecology*. VOL. 132, NO. 2, AUGUST 2018.

⁴⁷ Rose et al. Effect of Age on Opioid Prescribing, Overdose, and Mortality in Massachusetts, 2011 to 2015). *Obstetrics & Gynecology*. VOL. 132, NO. 2, August 2018.

Figure 30. High-Risk Populations of MassHealth Members by Age, MA: 2011-2015



- While 95% of MassHealth members aged 11-20 experienced just one or two non-fatal opioid overdoses (mean=1.2), the remaining 5% of members had as many as five non-fatal overdoses.

Table 3. Distribution of Non-Fatal Overdoses Among MassHealth Members with at Least One Non-Fatal Overdose by Age Group, 2011-2015

Count of Non-Fatal Overdoses	Ages 11-20 Years (N=479)		Ages 21-64 Years (N=22,507)		Total Members: Ages 11-64 Years (N=22,986)	
	Member Count	Percent	Member Count	Percent	Member Count	Percent
1	425	88.7%	16,088	71.5%	16,513	71.8%
2	30	6.3%	3,671	16.3%	3,701	16.1%
3+	24	5.0%	2,748	12.2%	2,772	12.1%
Total	479		22,507		22,986	

Veterans

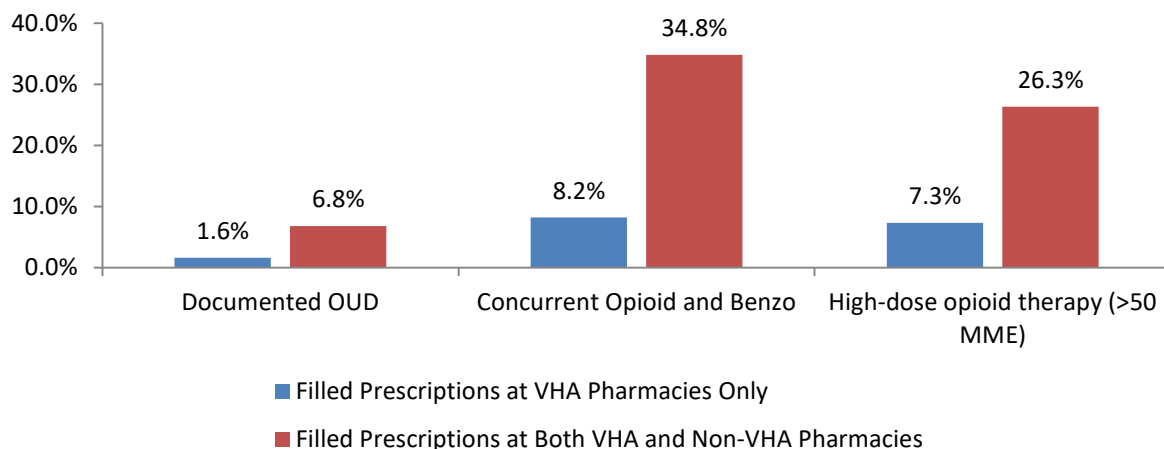
Background:

The opioid epidemic has greatly impacted active-duty military personnel and veterans who face especially elevated risks of opioid use disorder and overdose.^{48,49} The army has reported that among active-duty personnel, drug toxicity deaths more than doubled between 2006 and 2011, and overdose rates are greatly elevated among VA patients compared with the civilian population.⁵⁰ A May 2014 Veterans Health Administration (VHA) report indicated that 440,000 current patients were prescribed opioids, placing them at potential risk, and 55,000 veteran patients were diagnosed as having a current opioid use disorder, placing them at even greater risk.⁵¹ Previous studies have found that veterans are more likely to have ever had an opioid prescription, to have had a concurrent benzodiazepine prescription with their opioid prescription, and to have had their opioid prescription for 3 or more months at a dosage of 120 morphine milligram equivalent (MME) or higher.

Key Findings:

- Veterans receiving opioid prescriptions from both VHA and non-VHA pharmacies are more likely to receive high-dose opioid therapy (26% vs. 7%), have concurrent prescriptions of opioids and benzodiazepines (35% vs. 8%), be homeless (2% vs. 1%), and have higher Elixhauser mean physical (3.0 vs. 1.3) and mental co-morbidity scores (0.6vs. 0.2) when compared to Veterans that only fill prescriptions within the VHA system⁵² (Figure 31).

Figure 31. Opioid Prescribing Patterns, MA: 2011-2015



⁴⁸ Headquarters, Department of the U.S. Army. Army 2020: Generating Health & Discipline in the Force Ahead of the Strategic Reset. Report 2012. U.S. Army Website. <http://usarmy.vo.llnwd.net/e2/c/downloads/235822.pdf>. Published January 2012. Accessed May 11, 2015.

⁴⁹ Bennett AS, Elliott L, Golub A. Opioid and other substance misuse, overdose risk, and the potential for prevention among a sample of OEF/OIF veterans in New York City. *Subst Use Misuse*. 2013;48(10):894-907.

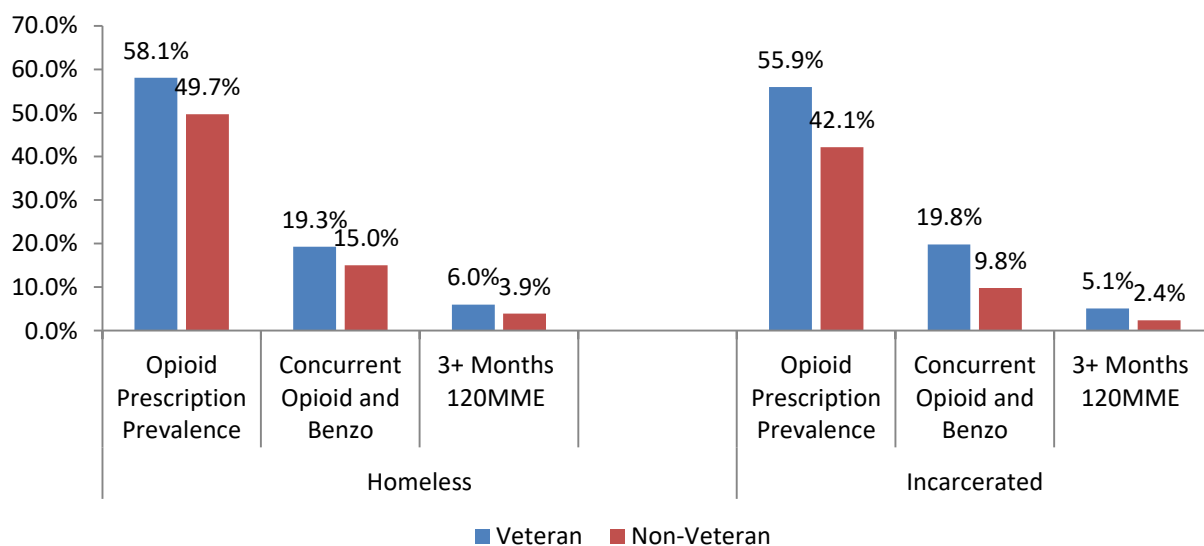
⁵⁰ Bohnert AS, Ilgen MA, Galea S, McCarthy JF, Blow FC. Accidental poisoning mortality among patients in the Department of Veterans Affairs Health System. *Med Care*. 2011;49(4):393-396.

⁵¹ Oliva EM. Opioid overdose education and naloxone distribution (OEND): preventing and responding to an opioid overdose. Department of Veterans Affairs Website. http://www.hsrd.research.va.gov/for_researchers/cyber_seminars/archives/video_archive.cfm?SessionID=868. Published September 2, 2014.

⁵² Jasuja GK, Ameli O, Miller DR, Land T, Bernson D, Rose AJ, Berlowitz DR, Smelson DA. Overdose Risk for Veterans Receiving Opioids From Multiple Sources. *Am J Manag Care*. 2018;24(11):536-540.

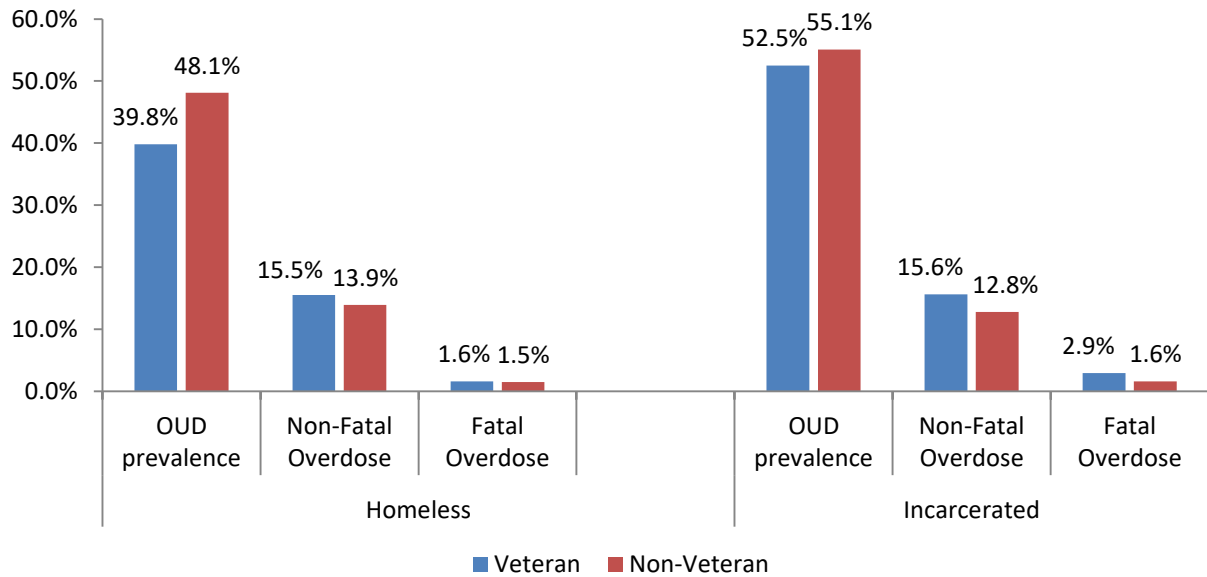
- Veterans receiving opioid prescriptions from both VHA and non-VHA pharmacies are more likely to have documented opioid use disorder (7% vs. 2%), and have 29% higher odds of a non-fatal opioid overdose and 66% higher odds of all-cause mortality when compared to Veterans that only fill prescriptions within the VHA system.⁵²
- Of the 6,282,697 non-veterans and 156,123 veterans in Massachusetts between 2011 and 2015, 0.63% (39,654) and 0.87% (1,366) had evidence of homelessness respectively. Further, 0.82% (51,692) of non-veterans and 0.67% (1,049) of veterans had a history of incarceration between 2011 and 2015. Homeless and incarcerated veterans were older, more likely to be male, and were made up of a higher proportion of white non-Hispanic individuals than their non-veteran counterparts.
- Within homeless and incarcerated populations, Veterans were more likely to have ever had an opioid prescription, to have had a concurrent benzodiazepine prescription with their opioid prescription, and to have had their opioid prescription for 3 or more months at a dosage of 120 morphine milligram equivalent (MME) or higher (Figure 32).

Figure 32. Opioid Prescribing Patterns by Veteran Status, MA: 2011-2015



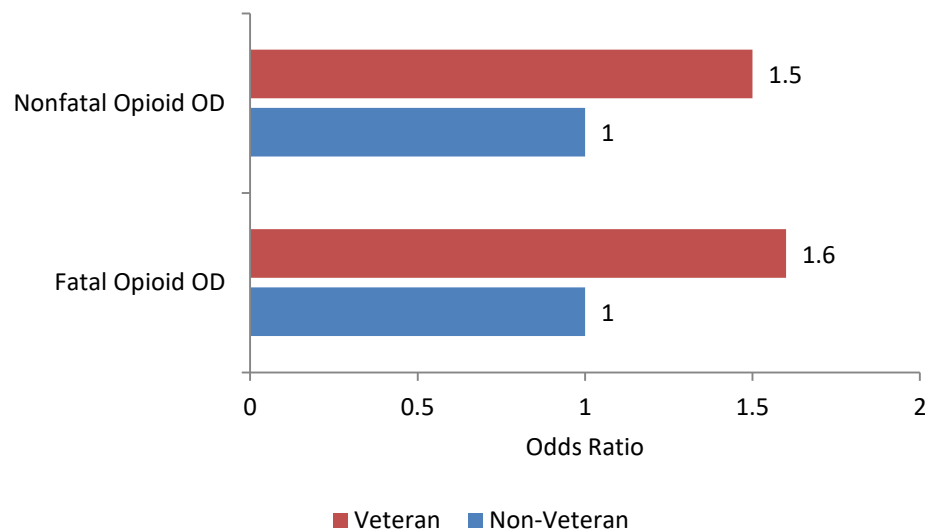
- Within homeless and incarcerated populations, opioid overdoses (both non-fatal and fatal) were more common among veterans than non-veterans (Figure 33).

Figure 33. OUD and Opioid Overdoses by Veteran Status, MA: 2011-2015



- When looking at a count of opioid prescriptions, Veterans had more prescriptions than non-veterans:
 - 11.2 prescriptions for recently incarcerated veterans versus 6.8 in the recently incarcerated non-veteran population
 - 12.6 prescriptions for homeless veterans versus 9.2 in the homeless non-veteran population
- Within homeless and incarcerated populations, veterans had 49% higher odds of a non-fatal opioid overdose (1.30-1.71) and 57% higher odds of a fatal overdose (1.15-2.13) than non-Veterans (Figure 34).

Figure 34. Adjusted Risk of Non-Fatal and Fatal Opioid Overdose by Veteran Status: MA, 2011-2015



- Massachusetts veterans have higher rates of non-fatal opioid overdose (136 non-fatal overdoses per 100,000 veterans vs. 84 per 100,000 non-veterans) and double the rate of fatal opioid overdoses (40 fatal overdoses per 100,000 veterans vs. 16 per 100,000 non-veterans) when compared to non-Veterans.
- Veterans have 69% higher odds of a non-fatal opioid overdose (1.58-1.81) and 132% higher odds of a fatal opioid overdose than non-veterans (2.06-2.63).

MassHealth Members

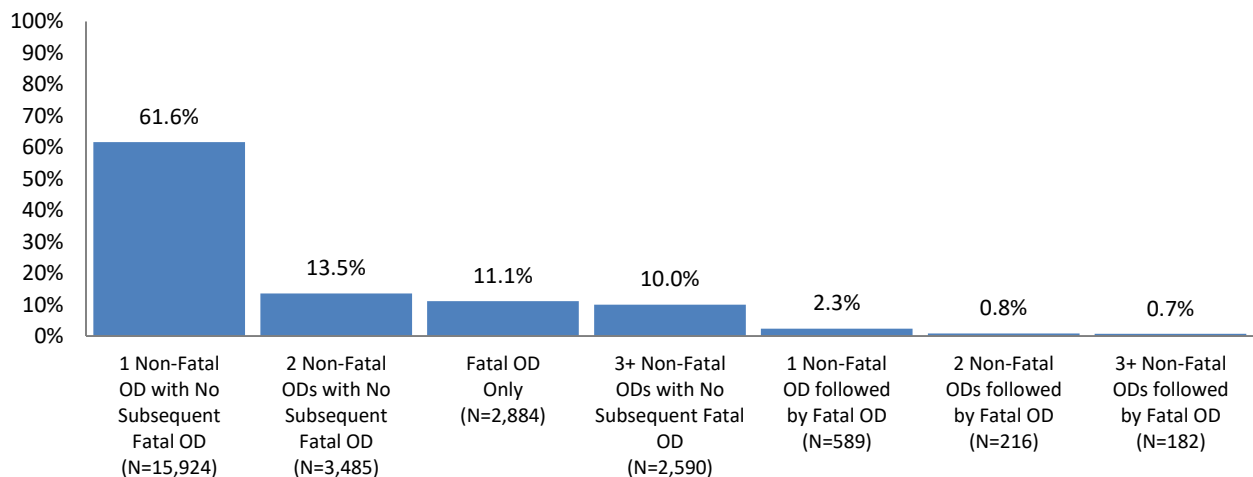
Background:

In support of their new Accountable Care Organization (ACO) roll-out, MassHealth explored the experience of MassHealth members who had a non-fatal and/or a fatal opioid-related overdose in order to better address the needs of high risk groups. These high risk groups included individuals experiencing homelessness, those who are unstably housed, and the formerly incarcerated, with a particular emphasis on members of those populations who have substance use disorders (SUD) and/or serious mental illness (SMI).

Key Findings:

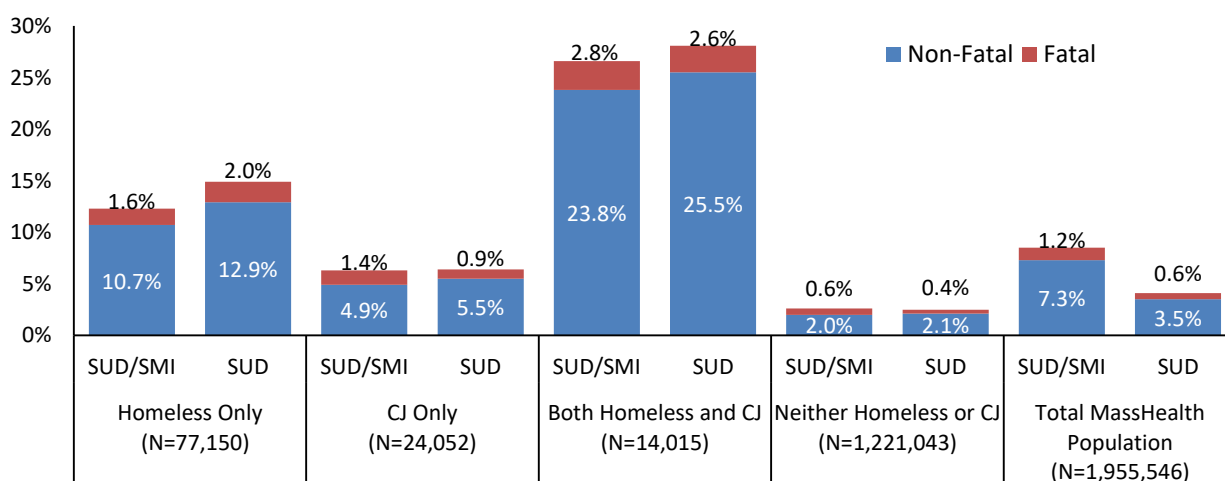
- Of the 1,955,546 MassHealth members in Massachusetts ages 11 and older, 2.4% had evidence of criminal justice involvement, 0.1% had evidence of homelessness and 9.9% had evidence of unstable housing between 2011 and 2015.
- Fewer adolescents (ages 11-17) than adults (ages 18 and older) who had experienced a non-fatal opioid overdose (NFOD) were enrolled in MassHealth (57% vs. 73%).
- Among MassHealth members overall, 3,955 members (0.2%) had a fatal opioid-related overdose and 22,033 (1.1%) had a non-fatal opioid-related overdose. As a comparison, among the non-MassHealth population, 0.02% individuals had a fatal opioid-related overdose and 0.12% had a non-fatal opioid-related overdose. Two-thirds of MassHealth members with an overdose had only one non-fatal overdose in the 5-year period. Fairly equal proportions of MassHealth members had 2 non-fatal opioid overdoses with no subsequent fatal overdose, 3+ non-fatal overdoses with no subsequent fatal overdose, or a fatal overdose alone (Figure 35).

Figure 35. Opioid Overdoses by Overdose Outcome, MassHealth Members, Ages 11-64, MA: 2011-2015



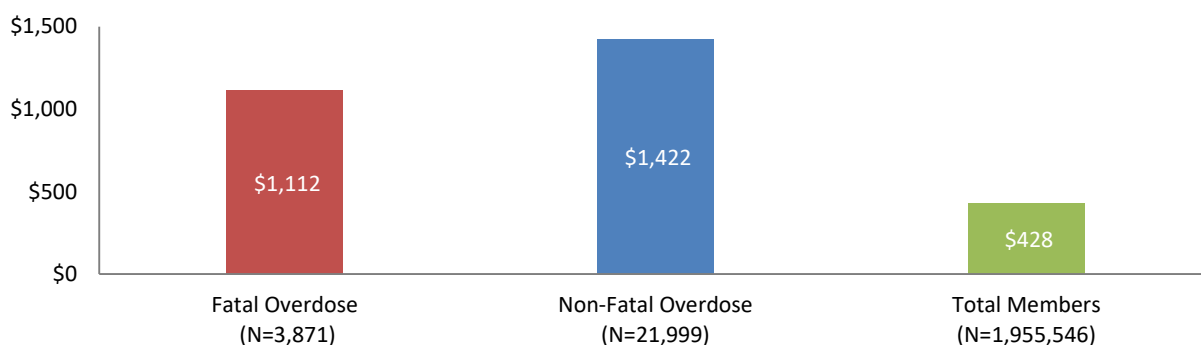
- MassHealth members who experienced homelessness and had co-occurring substance use disorder SUD/SMI, or a substance use disorder (SUD) diagnosis alone, had a higher percentage of both fatal and non-fatal opioid overdoses compared to the total MassHealth population. Additionally, being both homeless and criminal justice involved compounded the risk for a non-fatal overdose, regardless of diagnostic category (Figure 36).
 - Members with co-occurring diagnoses had non-fatal opioid overdose percentages three times higher, and
 - members with a single SUD diagnosis had non-fatal opioid overdose percentages that were seven times higher

Figure 36. Opioid Overdoses by SUD/SMI Illness Among Homeless and/or Criminal Justice Involved Populations, Ages 11-64, MA: 2011-2015



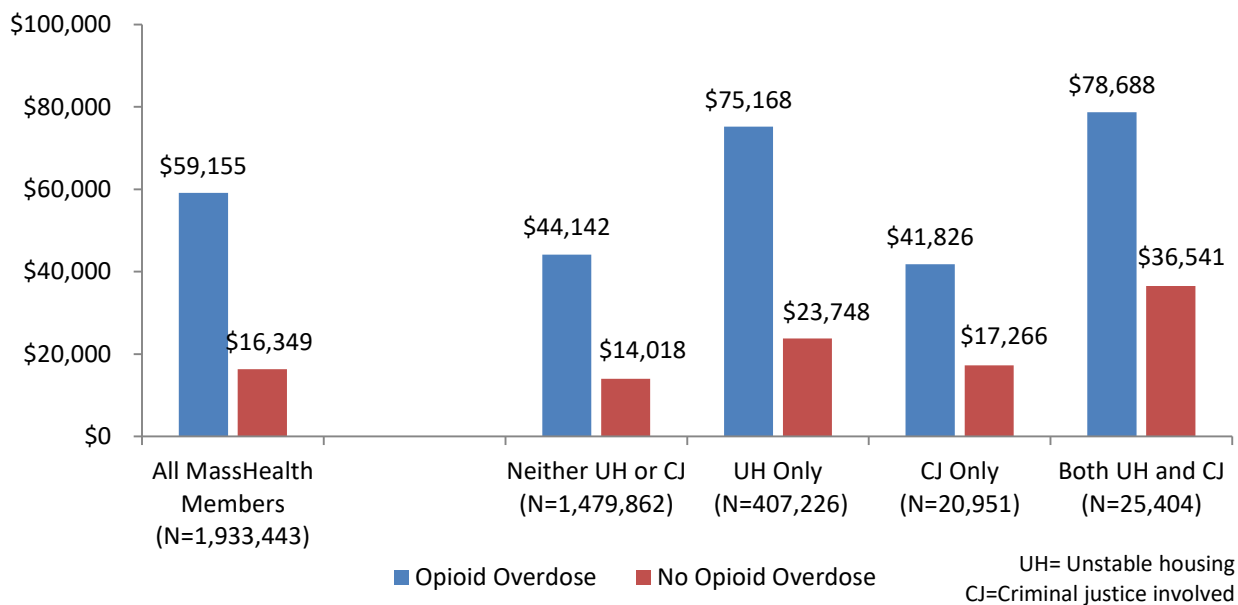
- For more information on MassHealth members who are recently incarcerated or experiencing homelessness, please see sections on Criminal Justice-Inmates recently released from prisons/jails on page 16 and People experiencing Homelessness on page 22.
- MassHealth members Medicaid paid claims per-member-per-month (PMPM) costs for people experiencing a fatal or non-fatal opioid overdoses were 2.5 to 3 times higher than for the entire the MassHealth population (Figure 37).

Figure 37. Annual Cost of Medicaid Paid Claims Per Member Per Month (PMPM), MA: 2012-2015



- The 5-year average MassHealth payments were substantially higher among those who had an opioid overdose compared with those who did not. Payments were the highest for those experiencing an opioid overdose who also experienced unstable housing or were criminal justice involved (Figure 38).

Figure 38. Five-Year Average MassHealth Payments by Study Population and Opioid Overdose Status, MA: 2011-2015



People Already in Treatment

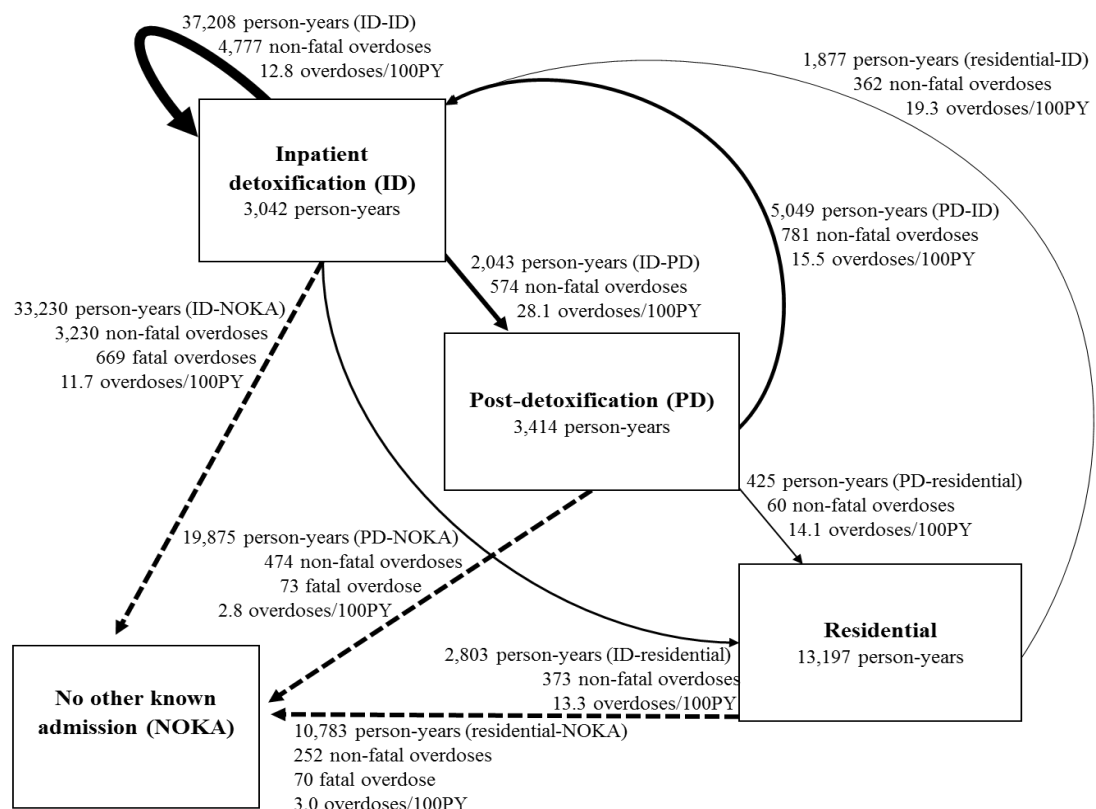
Background:

Inpatient treatment for substance use disorders has been standardized as a succession of steps—or “cascade” -- from acute detoxification to long- term residential care. Inpatient opioid managed withdrawal (detoxification) episodes represent an opportunity to engage individuals with opioid use disorder (OUD) in treatment. Treatment options following detoxification include further inpatient treatment through short-term residential and long-term residential programs, as well as medications for opioid use disorder (MOUD), including methadone, buprenorphine, or naltrexone. Individuals with OUD who experience homelessness are particularly vulnerable and may have disparities associated with receipt of these treatments. Residential treatment may be particularly effective among individuals experiencing homelessness; however, there are no data to compare post-detoxification outcomes by homelessness status.

Key Findings:

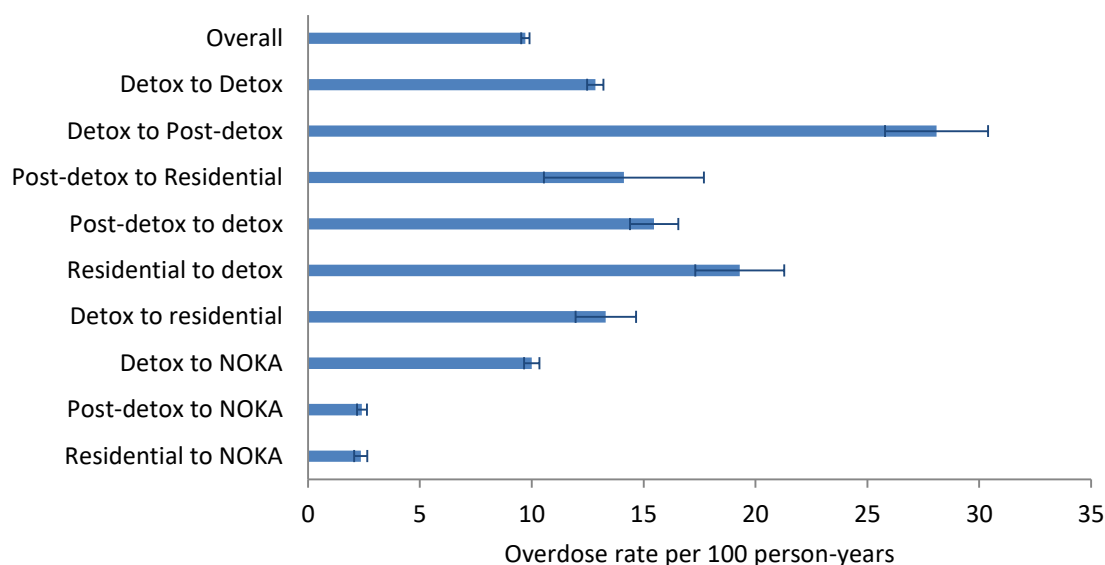
- In the Massachusetts inpatient treatment cascade, 30% of the total person-time was spent in transitions back to inpatient detoxification following any treatment stage, and these periods leading to readmission represent periods of elevated overdose risk (Figure 39).

Figure 39. Cascade of substance use disorder care, MA: January 2013-September 2015



- For the period of January 2013 through September 2015, 11,695 opioid-related overdoses were identified along the inpatient cascade of care, of which 93% were non-fatal and 7% of which were fatal.
- The rate of opioid overdose varied considerably across the cascade, and those times closest to a detoxification admission posed a higher risk of overdose. The highest risk of opioid overdose, (28.1 overdoses per 100 person-years), occurred in the transition period between detox treatment and post-detox, followed by the transition periods returning to detox following residential (19.3 overdoses per 100 person-years) or post-detox (15.5 overdoses per 100 person-years) treatment.
- The lowest rate of opioid overdose occurred among individuals who had exited the cascade and experienced no other known inpatient admissions, ranging from 11.7 overdoses per 100 person-years for those exiting after detoxification, 3.0 overdoses per 100 person-years after residential and 2.8 overdoses per 100 person-years after post-detox (Figure 40).

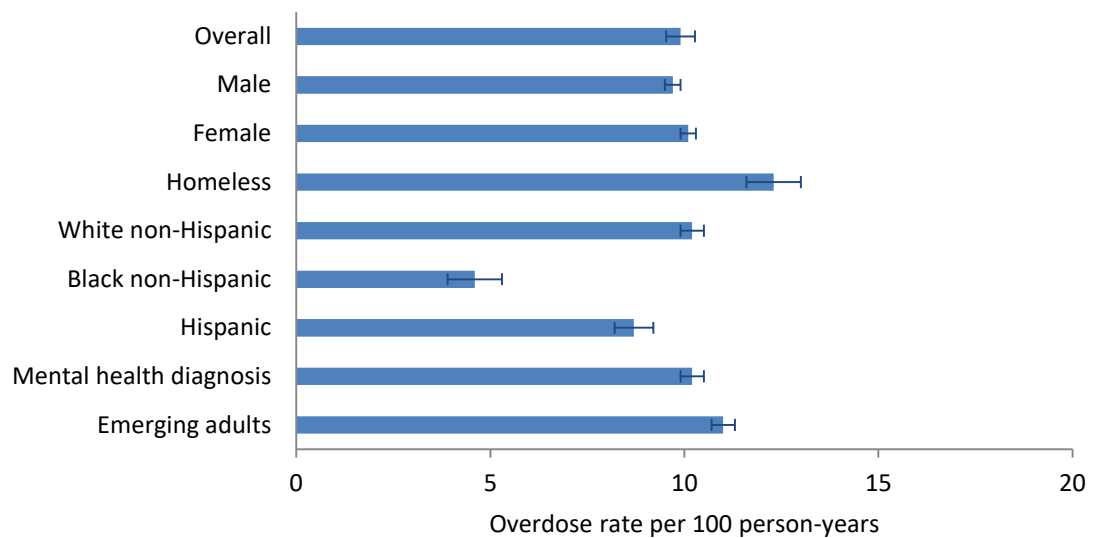
Figure 40. Overdose Rates Along the Treatment Cascade, MA: January 2013 to September 2015



Overdose rates stratified by the transition period along the treatment cascade. The black vertical line represents the overdose rate in the overall sample. NOKA = no other known admissions.

- Populations at higher opioid overdose risk included homeless individuals (12.3 overdoses per 100 person-years), those receiving mental health treatment during the study period (10.2 overdoses per 100 person-years), emerging adults aged 18 to 29 (11.0 overdoses per 100 person-years), and white non-Hispanics (10.2 overdoses per 100 person-years). Those at lower risk for opioid overdose on average were black non-Hispanics (4.6 overdoses per 100 person-years) and Hispanics (8.7 overdoses per 100 person-years) (Figure 41).

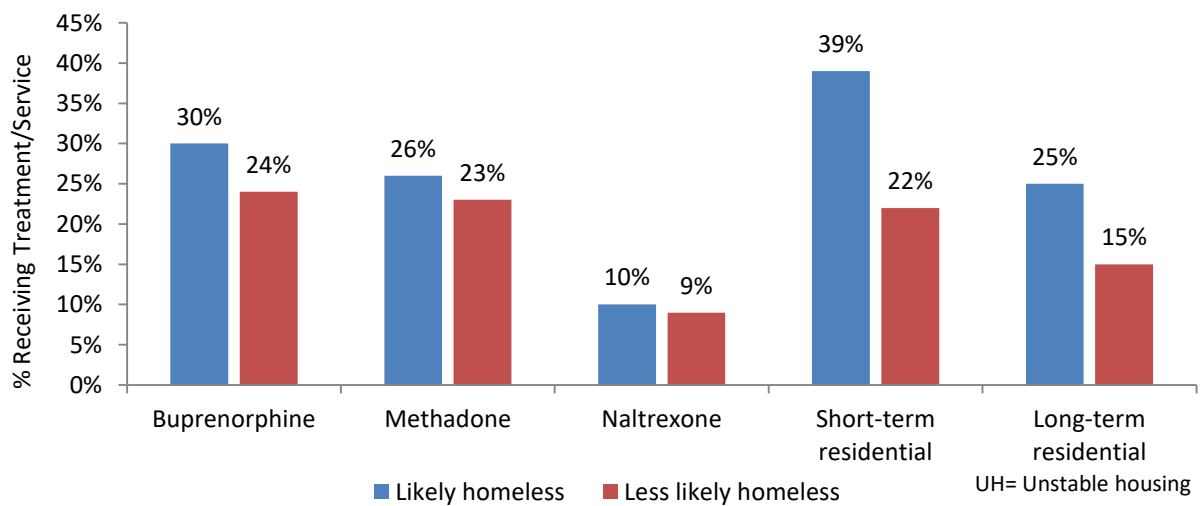
Figure 41. Overdose Among Populations Along the Treatment Cascade, MA: January 2013 to September 2015



Overdose rates along the treatment cascade stratified by population. The black vertical line represents the overdose rate in the overall sample.

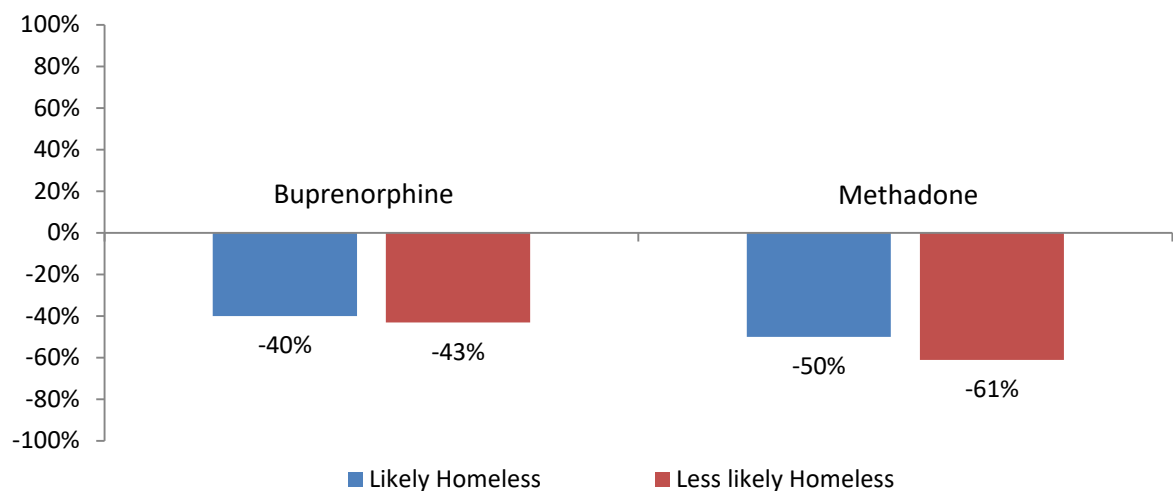
- Close to 30,000 individuals were identified with an opioid detoxification episode between 2012 and 2014. Of these, 48% were identified as having a high-likelihood (90% or higher probability) of having experienced homelessness. These individuals were more likely to receive all treatments, but especially more likely to enter short-term and long-term residential than those with lower or no likelihood of being homeless (Figure 42).

Figure 42. Receipt of Treatments and Services in the 12 Months After Opioid Detoxification Episode by Likelihood of Having Experienced Homelessness, MA: 2012-2014



- At one year of follow-up, treatment with buprenorphine was associated with a 40% reduction in mortality among individuals with high-likelihood of having experienced homelessness and 43% reduction among those less likely to have been homeless. Methadone receipt was associated with a 50% and 61% reduction in mortality reduction respectively among those more likely and less likely to have experienced homelessness. Naltrexone was not associated with mortality among either group (Figure 43).

Figure 43. Receipt Reduction in Mortality by Receipt of Treatment and by Likelihood of Having Experienced Homelessness, MA: 2012-2014



- Long-term residential treatment was associated with 48% reduction in mortality among individuals with a high-risk of having experienced homelessness, although only 25% of these individuals were served in a long-term residential facility. Short-term residential treatment was not associated with mortality in either group.

Communities at High Risk

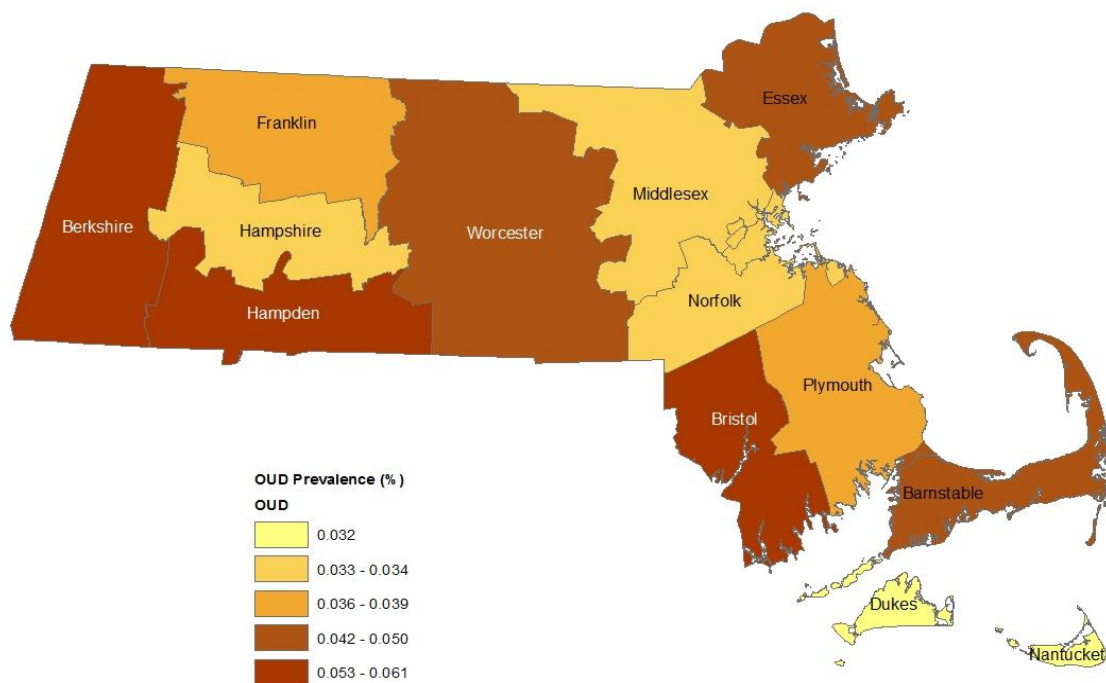
Background:

Every community in Massachusetts has been impacted by this growing opioid crisis but the impact on some communities has been especially pronounced. Since 2000, opioid-related deaths have increased in Massachusetts by 350% by 2015. However, beneath this statewide impact, data indicates that some areas of the Commonwealth have been disproportionately impacted by this opioid epidemic.

Key Findings:

- In 2015, the estimated opioid use disorder (OUD) prevalence ranged from 3.17% in Dukes and Nantucket counties to more than 6% in Berkshire County. The highest prevalence estimates were in counties with substantial rural populations such as Barnstable, Berkshire, Bristol, Hampden, and Worcester (5.03%, 6.06%, 5.81%, 5.34%, and 4.38%, respectively) (Barocas- Journal article: Estimated Prevalence of Opioid Use Disorder in Massachusetts, 2011–2015: A Capture–Recapture Analysis) (Figure 44).

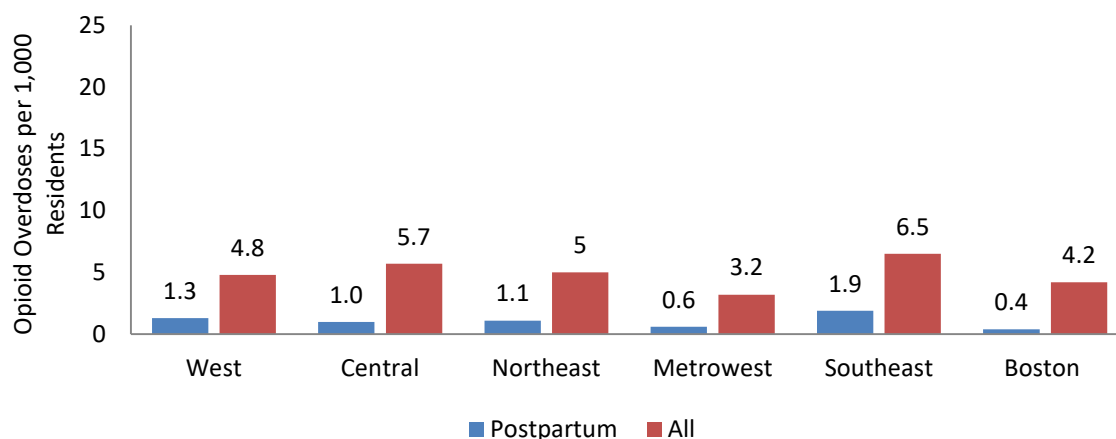
Figure 44. Prevalence of Opioid Use Disorder by County, MA: 2015



- Between 2014 and 2015, an overwhelming majority of the opioid-related overdose deaths had either stimulants or another drug in toxicology analysis at the time of death. Persons in rural areas were less likely than those in non-rural areas to overdose with opioids and stimulants in toxicology analysis than with opioids alone (OR: 0.5, 95% CI: 0.3-0.8).

- Opioid overdoses are not equally distributed across the Commonwealth, differing by region and community characteristics. This is true for postpartum overdoses as well overdoses among the general population. The Southeast region had the highest rate of postpartum opioid overdoses between January 1st, 2012 and September 30th, 2014 (1.9 per 1,000 deliveries) and overall opioid overdoses between January 1st, 2011 and December 31st, 2015 (6.5 per 1,000 residents) (Figure 45).

Figure 45. Comparing Postpartum and Overall Opioid Overdose Rates by EOHHS Region, MA: January 1st, 2012 to September 30th, 2014



- The overall opioid overdose rates were higher than postpartum overdose rates for all regions, but the difference was most pronounced for the Boston region, which had an overall overdose rate 9.6 times higher than its postpartum overdose rate.
- Similarly, both postpartum opioid overdose rates and the overall overdose rates for residents of a community increased as the median income of the community decreased. Compared to the wealthiest quarter of MA communities, the poorest quarter of communities had more 2.4 times the rate of postpartum overdose (1.3 vs. 0.5 per 1,000 deliveries) and 2.9 times the overall rate of overdose (6.6 vs. 2.3 per 1,000 residents).
- More adolescents (ages 11-17) than adults ages 18 and older who had experienced a non-fatal opioid overdose had an address in a rural zip code (14% vs. 7%)⁵³.
- For more information about health inequities in substance use treatments by geography and race and Hispanic Ethnicity, please see Section on Race/Ethnicity on page 8.
- Hotspot analyses (5-step process) were used to identify areas of with statistically significant clusters. Hotspots areas for fatal opioid overdose were identified in the Boston, Cape Cod, Merrimack Valley, Worcester, and Pioneer Valley areas.

⁵³ Chatterjee, A, et al. Non-fatal opioid-related overdoses among adolescents in Massachusetts 2012–2014. Drug and Alcohol Dependence 194 (2019) 28–31.

People Receiving Opioid Prescriptions

Background:

Most individuals who misuse opioids have been found to have been initially exposed to prescription opioids.^{54,55} The number of opioids prescribed to residents of Massachusetts increased roughly 7% annually from 2000-2015. In 2015, nearly one in six Massachusetts residents obtained an opioid prescription from a health care provider. Those receiving prescriptions obtained more than three filled prescriptions on average. Recent statistics show that in the first quarter of 2019, there were just over 518,000 Schedule II opioid prescriptions reported to the Massachusetts Prescription Monitoring Program (MassPAT); this is a notable decrease from the previous quarter and a 39% decrease from the first quarter of 2015.⁵⁶

Recently, attention has focused on potentially inappropriate prescribing (PIP) of opioids as a risk factor for fatal overdose, given its frequency and growth over time.^{57,58,59} Several studies have shown that multiple prescribers or multiple pharmacies are associated with opioid overdose.^{5, 60, 61} Other studies have also shown that high-dose opioids, defined as ≥ 100 mg morphine equivalents (MME) per day, or co-prescription of opioids with benzodiazepines, are associated with opioid overdose.^{62, 63,64,65,66}

Key Findings:

- About 57% of the state's adult population (3,078,034 people)—received at least one opioid prescription between 2011 and 2015.⁶⁷

⁵⁴ Jones CM, Paulozzi LJ, Mack KA. Sources of prescription opioid pain relievers by frequency of past-year nonmedical use United States, 2008- 2011. *JAMA Intern Med.* 2014;174:802–3.

⁵⁵ Schuchat A, Houry D, Guy GP. New data on opioid use and prescribing in the United States. *JAMA.* 2017;318:425–426.

⁵⁶ <https://www.mass.gov/lists/current-opioid-statistics#updated-data---q1-2019---as-of-may-2019>

⁵⁷ Liu Y, Logan JE, Paulozzi LJ, Zhang K, Jones CM. Potential misuse and inappropriate prescription practices involving opioid analgesics. *Am J Manag Care.* 2013;19:648–665.

⁵⁸ Gellad WF, Zhao X, Thorpe CT, et al. Overlapping buprenorphine, opioid, and benzodiazepine prescriptions among veterans dually enrolled in Department of Veterans Affairs and Medicare Part D. *Subst Abus.* 2017;38:22–5.

⁵⁹ Gwira Baumblatt JA, Wiedeman C, et al. High-risk use by patients prescribed opioids for pain and its role in overdose deaths. *JAMA Intern Med.* 2014;174:796–801.

⁶⁰ Cochran G, Gordon AJ, Lo-Ciganic WH, et al. An examination of claims-based predictors of overdose from a large medicaid program. *Med Care.* 2017;55:291–8.

⁶¹ Yang Z, Wilsey B, Bohm M, et al. Defining risk of prescription opioid overdose: pharmacy shopping and overlapping prescriptions among longterm opioid users in medicaid. *J Pain.* 2015;16:445–53.

⁶² Bohnert AS, Valenstein M, Bair MJ, et al. Association between opioid prescribing patterns and opioid overdose-related deaths. *JAMA.* 2011;305:1315–21.

⁶³ Zedler B, Xie L, Wang L, et al. Risk factors for serious prescription opioid-related toxicity or overdose among Veterans Health Administration patients. *Pain Med.* 2014;15:1911–29.

⁶⁴ Garg RK, Fulton-Kehoe D, Franklin GM. Patterns of opioid use and risk of opioid overdose death among medicaid patients. *Med Care.* 2017;55:661–8.

⁶⁵ Cochran G, Gordon AJ, Lo-Ciganic WH, et al. An examination of claims-based predictors of overdose from a large medicaid program. *Med Care.* 2017;55:291–8.

⁶⁶ Park TW, Saitz R, Ganoczy D, Ilgen MA, Bohnert AS. Benzodiazepine prescribing patterns and deaths from drug overdose among US veterans receiving opioid analgesics: Case-cohort study. *BMJ.* 2015;350:h2698.

⁶⁷ Association of Potentially Inappropriate Opioid Prescribing (PIP) and the Outcomes of All-Cause Mortality, Fatal Opioid Overdose, and Non-fatal Opioid Overdose in Massachusetts from 2011 to 2015.

- Many patients received potentially inappropriate prescriptions just once, and a subset received them repeatedly. Co-prescription of opioids and benzodiazepines was the most common type of PIP and rose consistently from 57,878 in 2011 to 64,208 in 2015; all other PIP variables steadily decreased.⁶⁸

Table 4. Potentially Inappropriate Opioid Prescribing (PIP), MA: 2011-2015

Variable	Frequency	Percent
Number of months with ≥ 100 mg of morphine equivalents		
None	2,847,155	92.5%
1	122,104	4.0%
2	33,608	1.1%
3+	75,167	2.4%
Highest number of opioid prescribers per quarter		
1	2,224,622	73.3%
2	528,324	17.4%
3	176,788	5.8%
4+	104,464	3.4%
Number of months co-prescribed benzodiazepines and opioids		
None	2,484,141	80.7%
1	326,047	10.6%
2	85,274	2.8%
3+	182,572	5.9%
Highest number of opioid pharmacies per quarter		
1	2,485,483	81.9%
2	436,547	14.4%
3	82,952	2.7%
4+	29,216	1.0%
Highest number of cash payments for opioids in a quarter		
None	2,289,309	74.4%
1	557,860	18.1%
2	132,372	4.3%
3+	98,493	3.2%
Duration of therapy by lack of documented pain diagnosis		
Less than 3 months/with documented pain diagnosis	1,550,643	50.4%
Less than 3 months/no documented pain diagnosis	1,152,989	37.5%
3 or more months/with documented pain diagnosis	296,951	9.6%
3 or more months/no documented pain diagnosis	77,451	2.5%

- Based on at least three months of such exposure to constitute PIP, 88.6% of recipients of prescription opioids did not have any PIP, 6.9% had one type, 2.7% had two, 1.2% had three, and

⁶⁸ Ibid

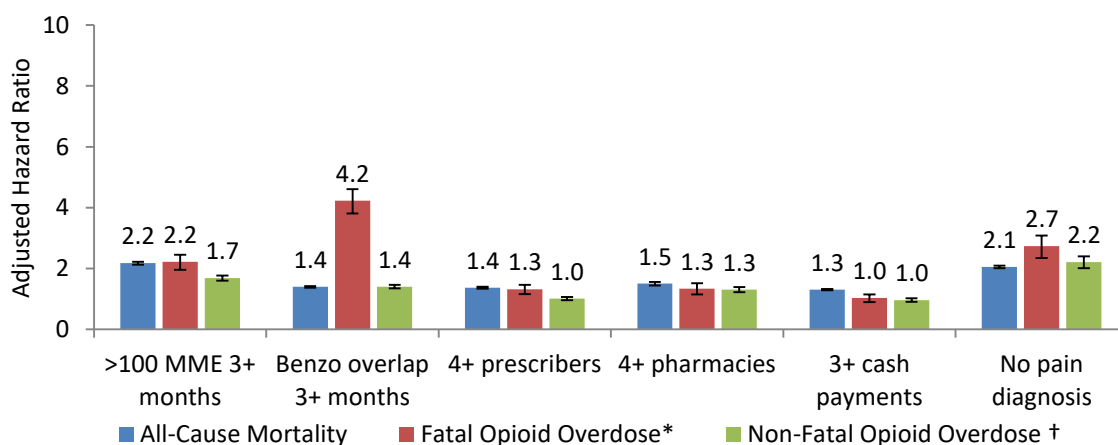
0.6% had four or more types of PIP. The annual prevalence of PIP increased from 2011 to 2012 (from 168,781 to 187,888) and then trended down to 162,575 in 2015.

Table 5. Frequencies and Percentages of Potentially Inappropriate Opioid Prescribing (PIP), MA: 2011–2015

Number of PIP subtypes received (out of a possible 6)*	Frequency	Percent
None	2,725,717	88.6%
1	213,671	6.9%
2	84,437	2.7%
4	36,147	1.2%
4, 5, or 6	18,062	0.6%

- All six types of PIP were associated with higher adjusted hazard for all-cause mortality, four of six with non-fatal opioid overdose, and five of six with fatal opioid overdose (Figure 46):
 - Lacking a documented pain diagnosis was associated with non-fatal opioid overdose (adjusted hazard ratio [AHR] 2.2, 95% [CI] 2.0–2.4). Lacking a documented pain diagnosis was associated with all-cause mortality (AHR 2.1, 95% CI 2.0–2.1).
 - High-dose opioids were also associated with non-fatal opioid overdose (AHR 1.7, 95% CI 1.6–1.8). High-dose opioids had twice the risk for all-cause mortality (AHR 2.2, 95% CI 2.1–2.2).
 - Co-prescription of benzodiazepines was associated with fatal opioid overdose (AHR 4.2, 95% CI 3.9–4.7).
 - Compared to those who received opioids without PIP, the hazard for fatal opioid overdose with one, two, three, and ≥ four PIP subtypes were 4.2, 7.1, 10.3, and 13.0.

Figure 46. Association of Potentially Inappropriate Opioid Prescribing (PIP) and the Outcomes of All-Cause Mortality, Fatal Opioid Overdose, and Non-Fatal Opioid Overdose, MA: 2011–2015



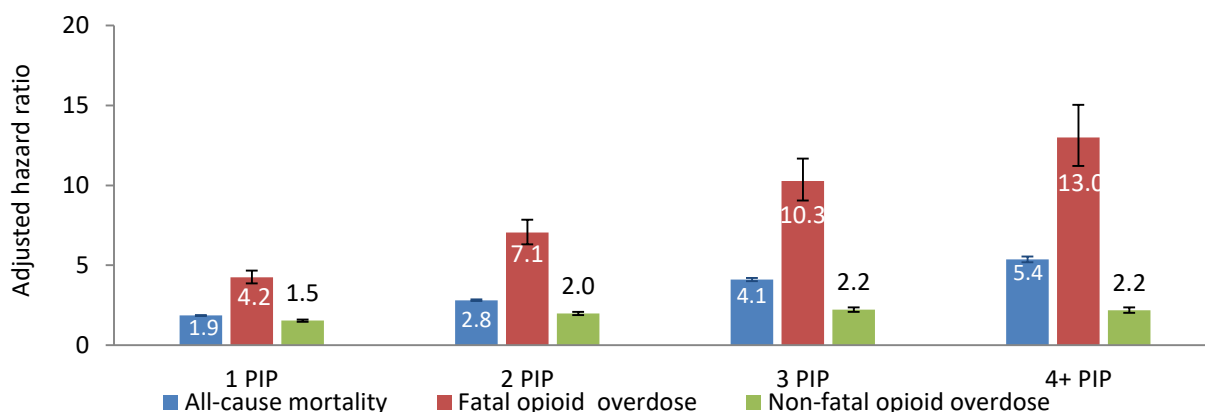
MME milligram morphine equivalents

*Every fatal overdose, by definition, is also all-cause mortality. †For non-fatal overdose, patients are only considered to have been exposed to PIP if the exposure occurred before the outcome

§Adjusted for age, sex, community-level poverty rate, depression, alcohol use disorder, rural town of residence, and the Elixhauser comorbidity index without the variables for depression and alcohol use disorder plus the other PIP variables. Models for fatal outcomes (all-cause mortality and fatal opioid overdose) are also adjusted for history of incarceration and history of homelessness.

- There is increasing risk for adverse events such as all-cause mortality and fatal opioid-overdose as the number of PIP types increased (Figure 47).

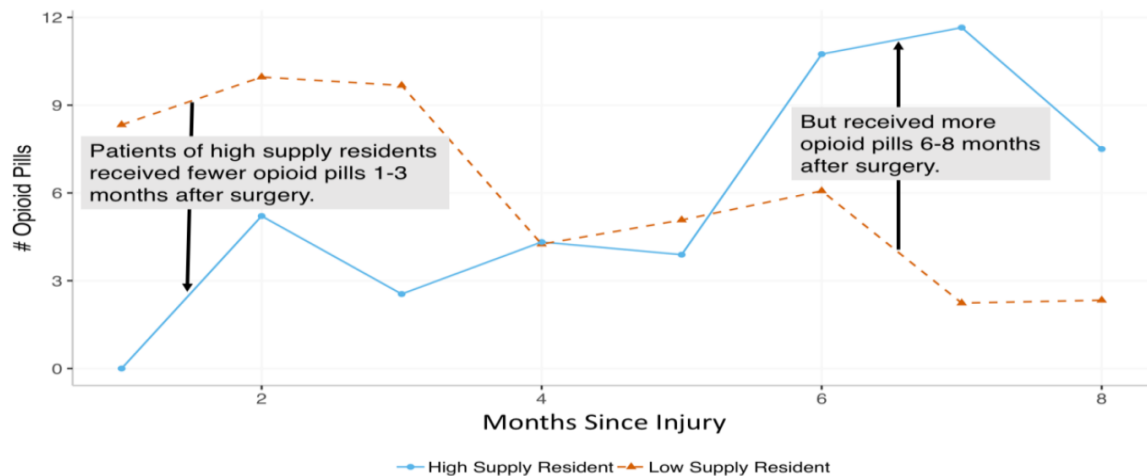
Figure 47. Odds Ratios of Potentially Inappropriate Prescribing Practices (PIP) by All-Cause Mortality, MA: 2011-2015



- Prescription quantity at discharge after a medical procedure is crucial in determining the short-term need for re-prescription and the long-term risk of dependence for patients. After surgery an opioid is often prescribed. Medical residents⁶⁹ vary in the decisions they make, with some residents prescribing more opioids than others in similar settings under the same attending physicians after surgery. These residents will be referred to as “high supply residents”. Patients of high supply (those in the top 1/3 of opioid prescribing) and low supply (everyone else) medical residents have comparable injuries and demographics, but the patients of “high supply residents” receive about 20 more opioid pills after their surgeries. The patients of high supply residents consequently have different patterns of opioid use in the months after surgery.
- In the first few months after surgery, patients of high supply residents (the blue solid line) receive fewer pills than patients of low supply residents (the orange dashed line), averaging 1 to 2 fewer pills per month. Six months after surgery, this relationship reverses, with the patients of high supply residents receiving about 2 more opioid pills per month (Figure 48).

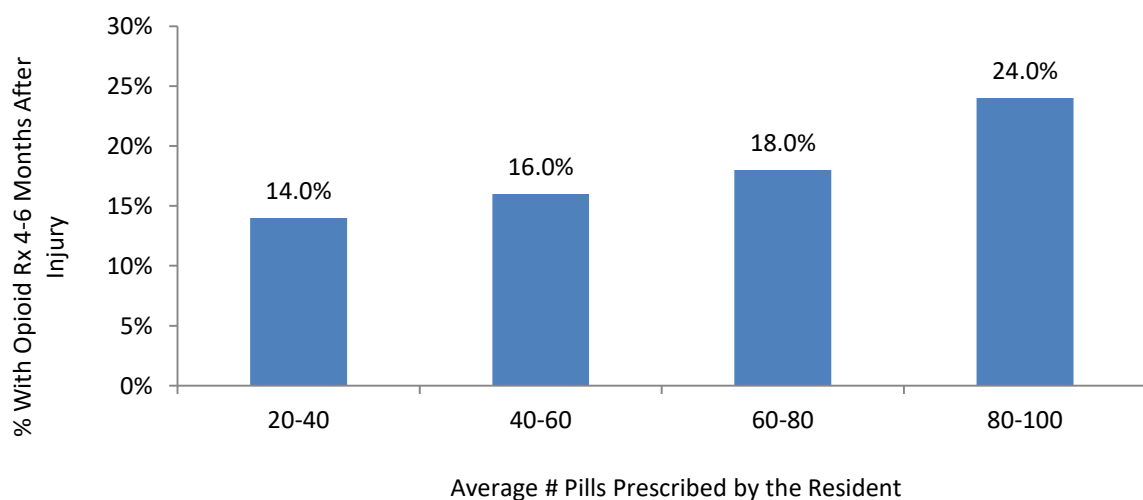
⁶⁹ Medical residents are qualified physicians who have passed their medical boards and who practice medicine under the direct or indirect supervision of a senior clinician.

Figure 48. Average Number of Opioid Pills Received by Patients of High and Low Supply Residents, MA: 2011-2015



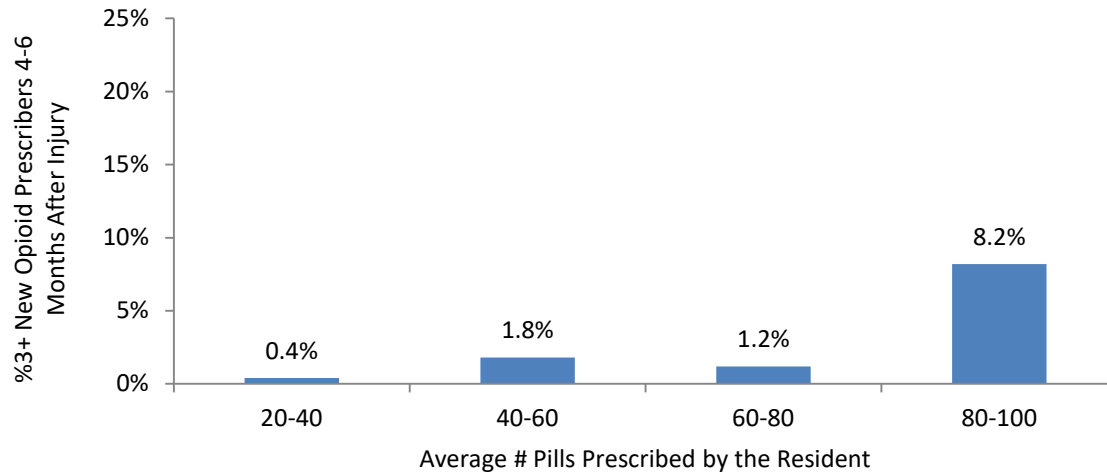
- Among patients with traumatic orthopedic injuries and no prior opioid use, 16% still use opioids four to six months after their initial injury (Figure 49). Patients of a resident who prescribes ten more pills at discharge than average are:
 - 14.4% more likely to have an opioid prescription four to six months after the initial injury.
 - 32.6% more likely to have at least three opioid prescriptions 4 to 6 months after discharge and 41.7% more likely to have at least five.

Figure 49. Patients with an Opioid Prescription 4-6 Months After Injury by Average Number of Pills Prescribed by Resident, MA: 2011-2015



- Patients of a resident who prescribe higher volumes of opioids at discharge are more likely to seek out additional prescribers in the four to six months after their injury (Figure 50).

Figure 50. Rates of Acquiring at Least 3 New Opioid Prescribers 4-6 Months After Injury by Resident Prescribing Tendencies, MA: 2011-2015



Section II. Medications for Opioid Use Disorder (MOUD) Treatment Efficacy

Background:

Medications for opioid use disorder (OUD) save lives. Yet most people with OUD in the United States receive no treatment at all, and only a fraction of those who do receive medications for OUD.

Key Findings:

- For the period of 2012 to 2014, there were 17,568 persons who had 1 or more non-fatal opioid overdoses in Massachusetts; 62% were male, and 69% were younger than 45 years. In the 12 months before the index overdose, 26% received 1 or more types of Medication for Opioid Use Disorder (MOUD), 41% received prescriptions for opioid analgesics, and 28% received prescriptions for benzodiazepines. Twenty-two percent had an episode of opioid detoxification.⁷⁰

Table 6. Baseline Patient Characteristics Before and Treatments After Index Non-fatal Opioid Overdose, MA: 2012-2014

Baseline Characteristic [†]	Full Cohort n=17,568 (%)
Male	10,955 (62%)
Age	
18-29 years	6,147 (35%)
30-44 years	5,915 (34%)
≥45 years	5,506 (31%)
Anxiety	3,034 (17%)
Any MOUD before index overdose	4,492 (26%)
Detoxification	3,872 (22%)
Opioid prescription	7,185 (41%)
Benzodiazepine prescription	4,871 (28%)

MOUD = medication for opioid use disorder.

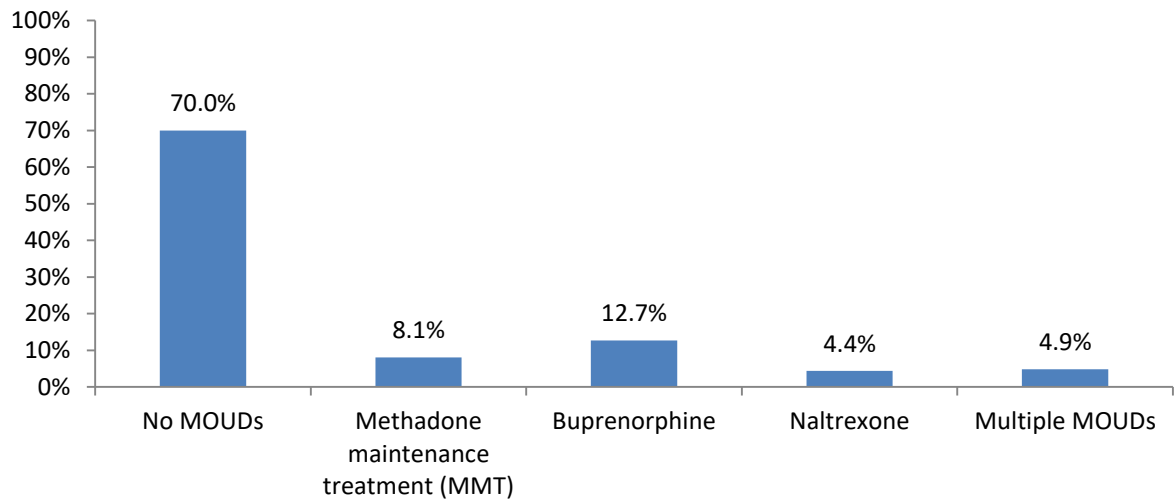
Index nonfatal opioid overdose was defined as a participant's first ambulance or hospital encounter for opioid overdose between January 2012 and December 2014 without death in the subsequent 30 d.

[†] Participants received these diagnoses, medications, or services in ≥1 of the 12 months preceding the index nonfatal opioid overdose.

- In the 12 months after the index overdose, 30% of participants received any MOUD, 8% received methadone maintenance treatment (MMT), 13% received buprenorphine, 4% received naltrexone, and 5% received more than 1 MOUD (Figure 51).

⁷⁰ Larochelle, M. et al. Medication for Opioid Use Disorder After Nonfatal Opioid Overdose and Association With Mortality. Ann Intern Med. doi:10.7326/M17-3107.

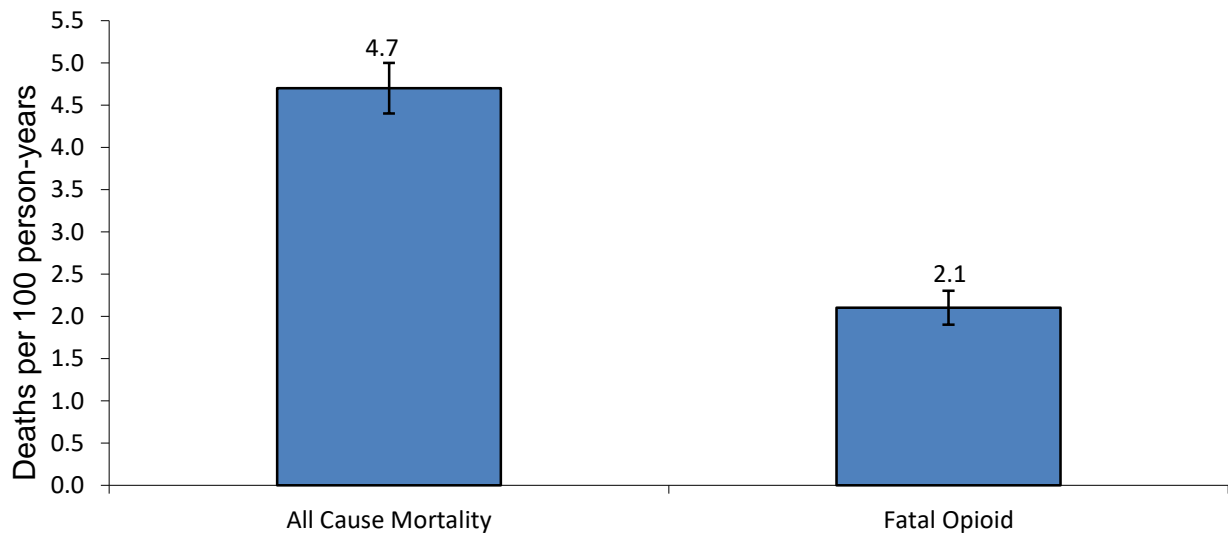
Figure 51. MOUDs in the 12 Months After Index Non-Fatal Opioid Overdose, MA: 2012-2014



MOUD=Medication for Opioid Use Disorder

- Patients receiving MOUD in the 12 months after the index overdose were more likely to be younger than 45 years, to have a diagnosis of anxiety or depression, and to have received detoxification treatment in the past 12 months.
- All-cause mortality at 12 months was 4.7 deaths per 100 person-years and for opioid-related mortality it was 2.1 deaths per 100 person-years (Figure 52).

Figure 52. All-Cause Mortality Rate and Opioid-Related Mortality Rate for Patients One Year Following Opioid Overdose, MA: 2012-2014



- Compared with no MOUD, MMT was associated with decreased all-cause mortality (adjusted hazard ratio [AHR], 0.47 [CI, 0.32 to 0.71]) and opioid-related mortality (AHR, 0.41 [CI, 0.24 to 0.70]). Buprenorphine was associated with decreased all-cause mortality (AHR, 0.63 [CI, 0.46 to 0.87]) and opioid-related mortality (AHR, 0.62 [CI, 0.41 to 0.92]). No associations between naltrexone and all-cause mortality (AHR, 1.44 [CI, 0.84 to 2.46]) or opioid-related mortality (AHR, 1.42 [CI, 0.73 to 2.79]) were identified (Figure 53).

Figure 53. Receipt Reduction in Mortality by Receipt of Treatment, MA: 2012-2014

