



Opioid-related Overdose Deaths in Massachusetts by Industry and Occupation: 2018-2020

Massachusetts Department of Public Health, Occupational Health Surveillance Program

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Like the rest of the nation, Massachusetts (MA) has been greatly impacted by the opioid epidemic, seeing a doubling of the annual rate of opioid-related overdose deaths between 2011 and 2020.¹ While opioid overdoses and deaths in MA have stabilized and even decreased among some groups in recent years, a better understanding of affected groups and more tailored prevention efforts would better ensure that deaths decline among all groups.

Our research has shown that workers in industries and occupations that place them at high risk for injury and illness have been most affected by the opioid epidemic. This finding is consistent with research showing increased use of prescribed opioids for pain management following work-related injury.^{2,3,4} Previous reports from the Massachusetts Department of Public Health (MDPH) Occupational Health Surveillance Program (OHSP) found that workers in Construction and Extraction occupations, as well as in Farming, Fishing, and Forestry occupations had much higher rates of fatal overdose than workers in other occupations.^{5,6}

The purpose of this data brief is to provide more recent information on the magnitude, trends, and risk factors for opioid-related overdose deaths among the working-age population in MA and to identify industries and occupations that have emerged with high rates and numbers of deaths since 2017, with a special focus on the effects of the COVID-19 pandemic in 2020. The numbers and rates of opioid-related overdose deaths vary across industries and occupations, suggesting that work-related factors should be considered in the strategic planning of outreach and intervention efforts to reverse the harmful effects of this epidemic.

Data Highlights and Prevention Measures

Massachusetts death certificates were analyzed to identify opioid-related overdose deaths from 2018 through 2020, among working-age decedents (residents 16 years or older) for whom valid industry and/or occupation information was available. Occupation describes the kind of work an individual does to earn a living (i.e., job title), while industry describes the activities the individual's employer is engaged in. Additional factors (such as availability of paid sick leave) that may help explain why opioid-related overdose death rates among working-age decedents vary by industry and occupation were also examined. Key data highlights and associated prevention measures are:

Key Data Highlights:

- The 2020 opioid-related overdose death rate has increased 10.5% from 2019 to 2020. The data also shows that there were more fatal opioid overdoses in 2020 among decedents of working age than ever before.
- The opioid-related overdose death rate for all Massachusetts workers across all industry sectors was 44.7 deaths per 100,000 workers in 2018-2019 and 48.8 deaths per 100,000 workers in 2020.
- Opioid-related overdose death rates for eleven industry sectors (out of 20) increased in 2020 compared to 2018-2019. This shift was most pronounced for the following three industry sectors: Accommodation and Food Services; Real Estate and Rental and Leasing; and Retail Trade.
- The opioid-related overdose death rate for all Massachusetts workers across all occupation groups was 48.4 deaths per 100,000 workers in 2018-2019 and 57.4 deaths per 100,000 workers in 2020.

¹ Massachusetts Department of Public Health (2021). Data Brief: Opioid-Related Overdose Deaths among Massachusetts Residents.

<https://www.mass.gov/doc/opioid-related-overdose-deaths-among-ma-residents-may-2021/download>

² Franklin, G. M., Stover, B. D., Turner, J. A., Fulton-Kehoe, D., & Wickizer, T. M. (2008). Early opioid prescription and subsequent disability among workers with back injuries: the Disability Risk Identification Study Cohort. *Spine*, 33(2), 199-204.

³ Dembe, A., Wickizer, T., Sieck, C., Partridge, J., & Balchick, R. (2012). Opioid use and dosing in the workers' compensation setting. A comparative review and new data from Ohio. *American Journal of Industrial Medicine*, 55(4), 313-324.

⁴ Savych B, Neumark D, Lea R. (2019). Do opioids help injured workers recover and get back to work? The impact of opioid prescriptions on duration of temporary disability. *Ind Relat*, 58, 549-90.

⁵ Massachusetts Department of Public Health (2018). Opioid-related Overdose Deaths in Massachusetts by Industry and Occupation, 2011-2015. <https://www.mass.gov/files/documents/2020/03/19/opioid-industry-occupation.pdf>

⁶ Massachusetts Department of Public Health (2021). Opioid-related Overdose Deaths in Massachusetts by Industry and Occupation, 2016-2017. <https://www.mass.gov/doc/opioid-related-overdose-deaths-by-industry-and-occupation-2016-2017-0/download>

- Opioid-related overdose death rates for seventeen occupational groups (out of 22) increased in 2020 compared to 2018-2019. This shift was most pronounced for the following occupation groups: Food Preparation and Serving Related; Healthcare Support; and Legal.
- The rate for all workers, as well as the rates for all racial/ethnic groups increased in 2020, however, the rate for Black, non-Hispanics nearly doubled in 2020 compared to more modest annual increases in previous years.
- In 2020, groups with workers reporting lower percentages of access to paid sick leave had opioid overdose rates that were higher (4.9 and 3.5 times, respectively, for industry and occupation) than groups with workers reporting higher percentages of access to paid sick leave.

It is important to note, due to the COVID-19 pandemic and subsequent public health interventions, many experienced disruptions to employment (e.g., job loss) or changes in the nature of their work (e.g., work from home). Between March and April 2020, there was a rapid drop in employment, with many workers leaving the workforce, shifting jobs, or taking pay cuts/reduced hours. The impact was especially pronounced in some industry sectors and occupational groups. The following few months brought a gradual re-opening of certain industry sectors, although some never returned to full capacity or full in-person work. An aim of this data brief is to examine the 2020 overdose deaths by industry and occupation to understand how patterns of death in 2020 might vary compared to previous non-pandemic years.

Workplace Strategies to Prevent Opioid-related Overdose Deaths:

The workplace is an important venue for health and safety, which includes concerns related to opioid-related overdose prevention. As this data brief demonstrates, certain industry and occupation groups have higher rates of opioid-related overdose deaths. Employers, unions, employee assistance programs, community organizations, practitioners, insurers, and government agencies can all play an important role in preventing fatal opioid-related overdose:

- Create a work environment that fosters communication, cultivates connectedness, and promotes asking for help
- Stronger health and safety measures and policies that can reduce ergonomic risk factors and prevent injury at the worksite
- Recovery-friendly workplace initiatives/compassionate drug-free workplace policies
- Employee assistance/peer support programs
- Naloxone training, as appropriate
- Stay at work/return to work accommodations
- Improved employee benefits (e.g., access to health insurance options that cover nonpharmacologic pain treatments)
- Organizational supports for their employees' treatment for and recovery from substance use/opioid dependency
- Equity-centered approaches to combat the large inequities seen in overdose rates between various populations are needed. This involves including voices from the communities of focus in dissemination and intervention planning, as well as being intentional in outreach strategies to reduce the gaps seen in the data below.
- Integrated approaches to COVID-19 vaccine outreach, such as combining COVID-19 vaccination information with harm reduction strategies (e.g., naloxone training, fentanyl test strip distribution), and mental health services

Selected Examples of Current MDPH Prevention Efforts to Support Workers

Across the state, there are many prevention initiatives and activities that are designed for workers and that address the complex associations between work and opioid use. Described below are a few examples of this work:

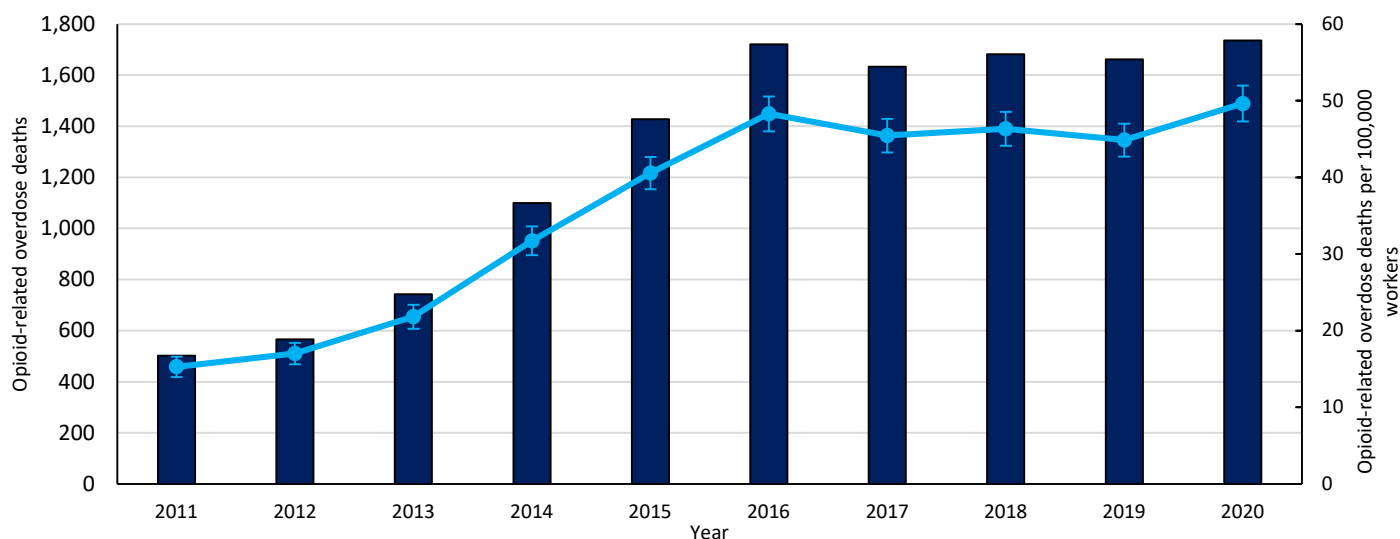
- In collaboration with Health Resources in Action (HRiA), in work funded by the State Opioid Response (SOR) grant, MDPH has developed new trainings and a comprehensive website aiming to increase opioid awareness and provide resources for Massachusetts employers to implement policies and practices that build capacity for 'upstream' prevention efforts. More information can be found here: <https://behereinitiative.org/workplace/>.
- The agency that oversees the state's workers' compensation system, the Massachusetts Department of Industrial Accidents (DIA), has a program called the Opioid Alternative Treatment Pathway (OATP). Injured workers who have been prescribed opioids for pain and are facing a litigation process with insurers can voluntarily enter the OATP to gain immediate access to care coordinators who work with them and their medical providers to safely taper/reduce their use of opioids and to use alternative pain management strategies, with a goal of helping them regain functionality for an improved quality of life, or a return to work. MDPH is funding a researcher from UMass Lowell to conduct an evaluation of the OATP; results from this evaluation have been well received by the DIA are already being incorporated into OATP to improve the program.
- The Fatality Assessment and Control Evaluation (FACE) Project at MDPH has drafted a protocol for on-site investigation of worksites where a fatal overdose has occurred. This FACE protocol will allow for the identification of factors that precede or happen during the emergency response at the worksite; information obtained will help guide the development of comprehensive recommendations for employers to prevent similar deaths and provide organizational supports for their employees. In collaboration with researchers from UMass Lowell and Massachusetts College of Pharmacy and Health Sciences, the tool is being piloted in the summer and fall of

2022.

- At a community level, MDPH-funded prevention initiatives, such as Hampshire HOPE, have been working to educate local employers about opioids and the workplace. This work involves developing a toolkit for employers to support a recovery-friendly workplace.
- As part of MDPH's Vaccine Equity Initiative, a program aiming to increase the number of people vaccinated against COVID-19 in communities hard-hit by the pandemic, vaccine outreach efforts to worker groups particularly impacted by the opioid epidemic (e.g., fishing, construction) also include opioid overdose prevention services.
- MDPH's Bureau of Substance Addiction Services (BSAS) recently started a recovery-based re-entry services program focused on Black and Latino Men. The program serves Black and Latino men with a history of substance misuse who have been incarcerated in Suffolk, Essex, Worcester, and Hampden counties and provides funding to local non-profit, community-based organizations to provide culturally responsive wraparound services. This work is especially relevant, given the findings presented below on the elevated rates of overdose among Black, non-Hispanic workers.

Opioid-related Overdose Death Rates among Workers

Figure 1. Rate and number of opioid-related overdose deaths among Massachusetts working-age decedents, n=12,770

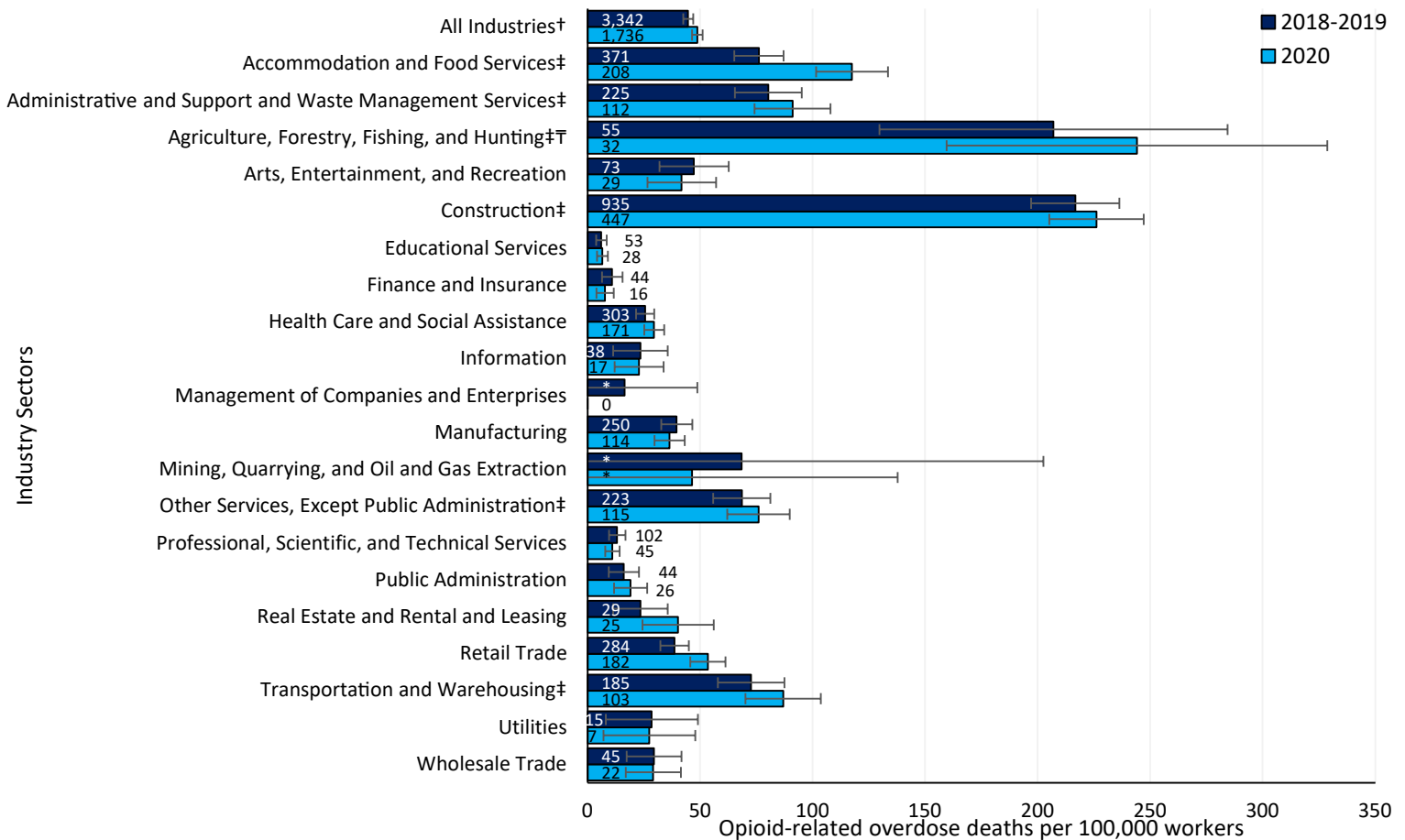


Numerator source: Massachusetts Registry of Vital Records and Statistics, 2011-2020
Denominator source: American Community Survey, 2011-2020

- The 2020 opioid-related overdose death rate has increased 10.5% from 2019 to 2020. The data also shows that there were more fatal opioid overdoses in 2020 among decedents of working age than ever before.
- From 2011 through 2016 there was a 26.9% increase in opioid-related overdose deaths among Massachusetts working-age decedents ($p < 0.05$). The 2020 opioid-related overdose death rate (49.6 deaths per 100,000 workers) is approximately 2.7% higher than in 2016 (48.3 deaths per 100,000 workers), though this difference is not statistically significant. Since 2016, the opioid-related overdose death rate among Massachusetts workers had been relatively stable.
- These findings are consistent with opioid-related overdose deaths seen throughout Massachusetts statewide. Overall, the opioid-related overdose death rate has been stable for the past several years.

Opioid-related Overdose Death Rates by Industry and Occupation

Figure 2. Rate of opioid-related deaths among Massachusetts working-age decedents by industry sectors



† In 2018-2019, this category excluded 14 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 50 opioid-related overdose deaths because the death certificates did not contain enough information to code industry; In 2020, this category excluded 5 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 13 opioid-related overdose deaths because the death certificates did not contain enough information to code industry.

*Suppressed due to cell size restriction

‡Industries with a statistically significant higher rate compared to the rate for all workers

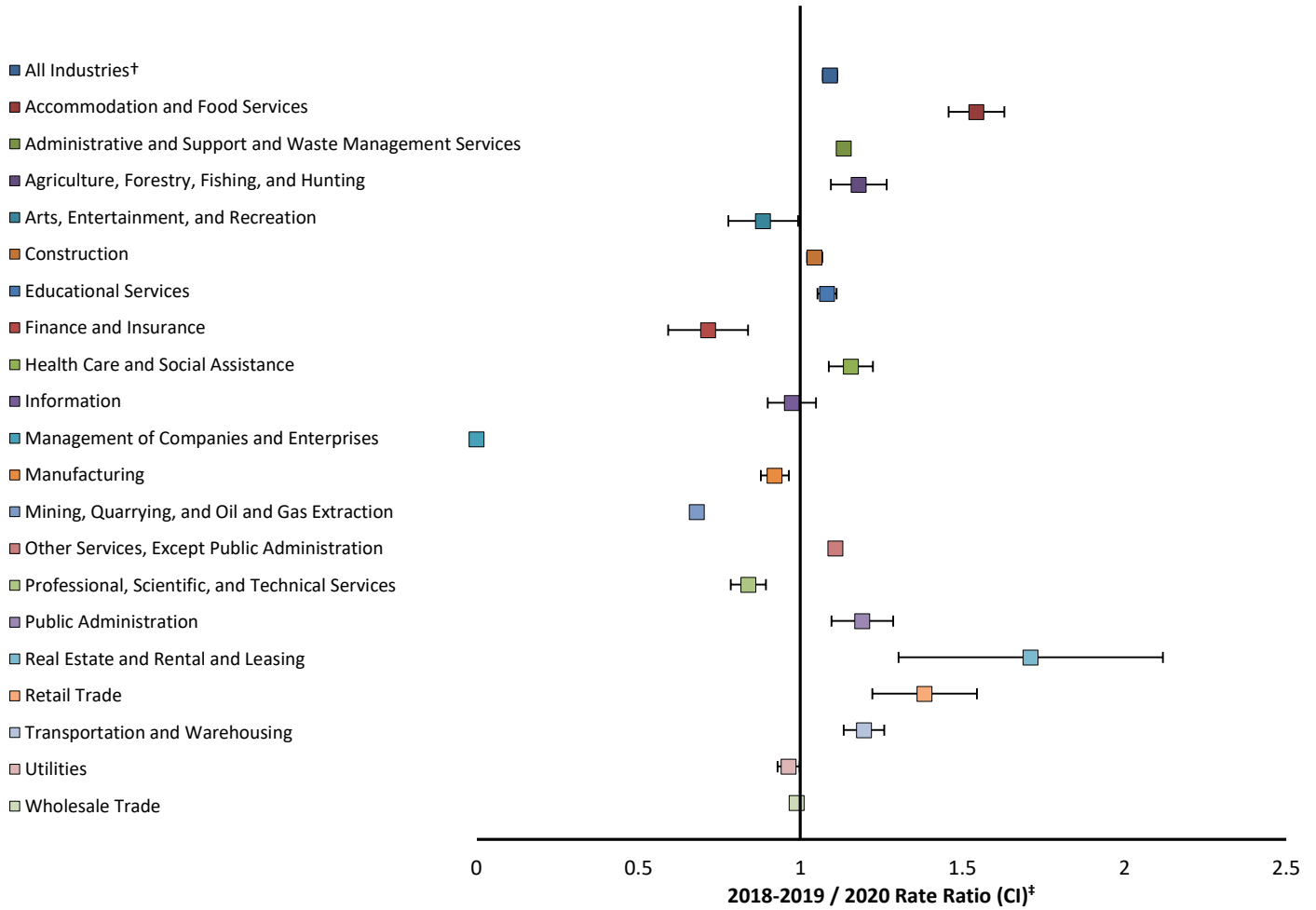
†† 65.6% of these deaths occurred among workers employed in Fishing industries

Numerator source: Massachusetts Registry of Vital Records and Statistics, 2018-2020

Denominator source: American Community Survey, 2018-2020

- The Construction industry sector had the highest rate of opioid-related overdose deaths (216.7 deaths per 100,000 workers in 2018-2019 and 226.2 deaths per 100,000 workers in 2020) and the highest number of opioid-related overdose deaths (n=935 in 2018-2019 and n=447 in 2020).
- The following industries had opioid-related overdose death rates that were significantly higher than the rate for all Massachusetts workers in all industries:
 - Accommodation and Food Services (76.2 deaths per 100,000 workers in 2018-2019; 117.5 deaths per 100,000 workers in 2020)
 - Administrative and Support and Waste Management Services (80.4; 91.1)
 - Agriculture, Forestry, Fishing, and Hunting (207.0; 244.1)
 - Construction (216.7; 226.2)
 - Other Services, Except Public Administration (68.5; 75.9)
 - Transportation and Warehousing (72.7; 86.9)

Figure 3. Rate ratios of opioid-related deaths among Massachusetts working-age decedents by industry sectors, comparing 2018-2019 vs. 2020



† In 2018-2019, this category excluded 14 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 50 opioid-related overdose deaths because the death certificates did not contain enough information to code industry; In 2020, this category excluded 5 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 13 opioid-related overdose deaths because the death certificates did not contain enough information to code industry.

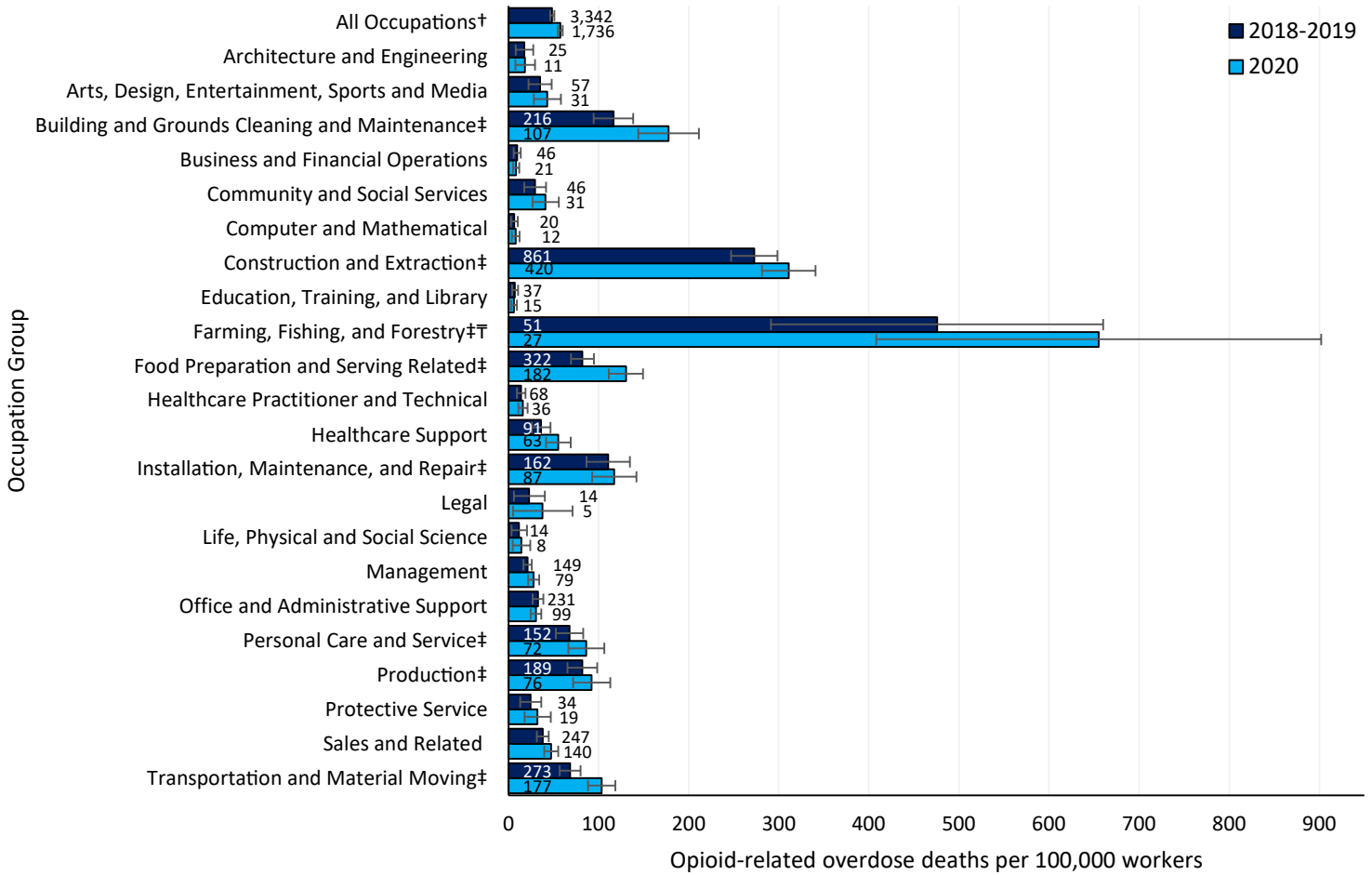
‡ Rate ratios are the difference in opioid-related overdose death rates from 2018-2019 to 2020. If the rate ratio and confidence interval (CI) includes 1, it means there is no difference in the rates of 2018-2019 and 2020. If the rate ratio and CI favors the left (less than one) and does not include 1, it means the rate of 2018-2019 is statistically greater than the rate of 2020. If the rate ratio and CI favors the right (greater than one) and does not include 1, it means the rate of 2020 is statistically greater than the rate of 2018-2019.

Numerator source: Massachusetts Registry of Vital Records and Statistics, 2018-2020
Denominator source: American Community Survey, 2018-2020

Compared to 2018-2019, the rate of opioid-related overdoses among Massachusetts workers in the following industries increased in 2020:

- Accommodation and Food Services
- Administrative and Support and Waste Management Services
- Agriculture, Forestry, Fishing, and Hunting
- Construction
- Educational Services
- Health Care and Social Assistance
- Other Services, Except Public Administration
- Public Administration
- Real Estate and Rental and Leasing
- Retail Trade
- Transportation and Warehousing

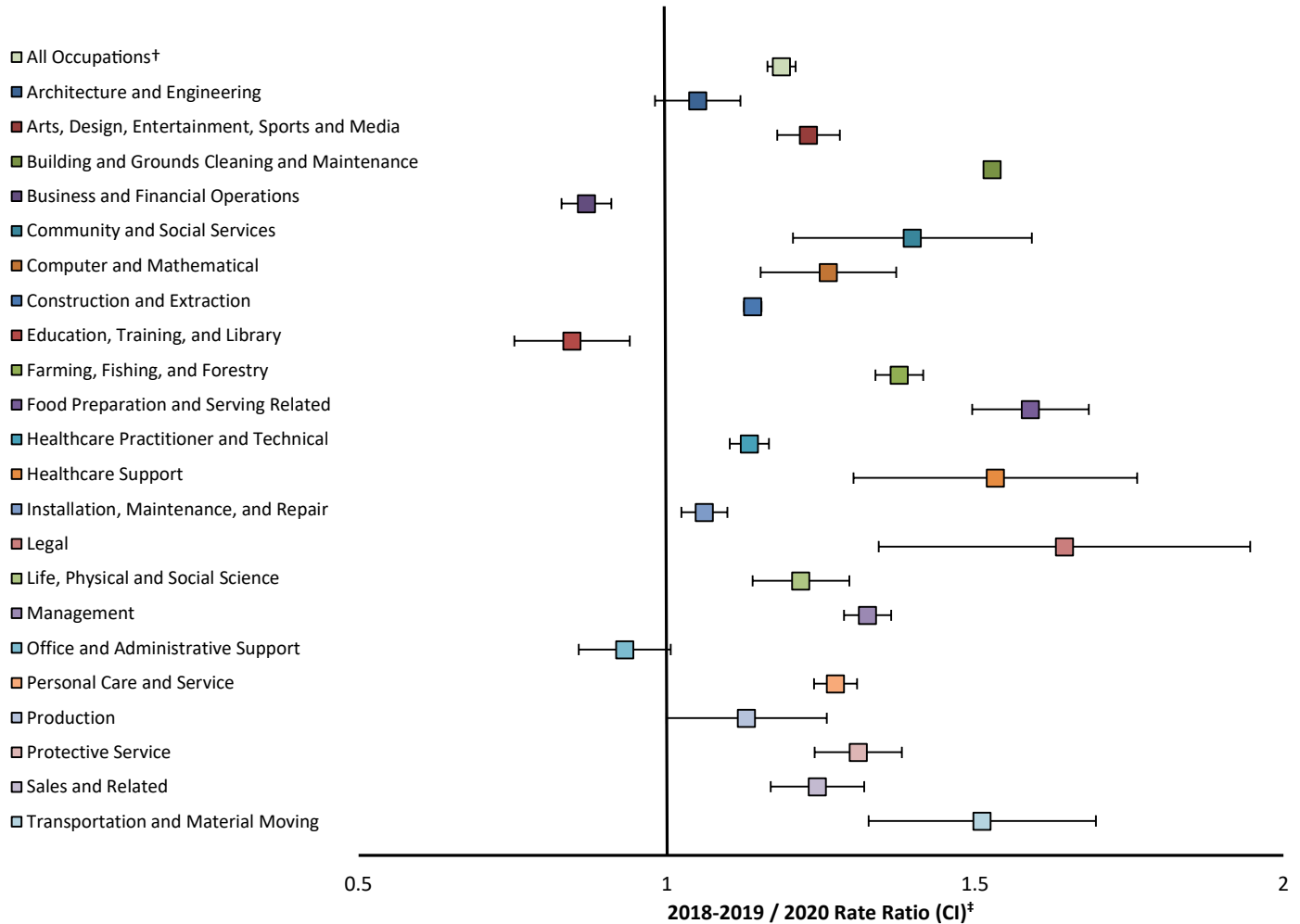
Figure 4. Rate of opioid-related deaths among Massachusetts working-age decedents by occupational groups



† In 2018-2019, this category excluded 14 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 23 opioid-related overdose deaths because the death certificates did not contain enough information to code occupation ; In 2020, this category excluded 5 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 13 opioid-related overdose deaths because the death certificates did not contain enough information to code occupation.
 ‡ Occupations with a statistically significant higher rate compared to the rate for all workers
 † at least 74.1% of these deaths occurred among workers employed in Fishing occupations
 Numerator source: Massachusetts Registry of Vital Records and Statistics, 2018-2020
 Denominator source: American Community Survey, 2018-2020

- The opioid-related overdose death rate for all Massachusetts workers across all occupation groups was 48.4 deaths per 100,000 workers in 2018-2019 and 57.4 deaths per 100,000 workers in 2020.
- The Construction and Extraction occupation group had the second highest rate of opioid-related overdose deaths (272.8 deaths per 100,000 workers in 2018-2019 and 310.8 deaths per 100,000 workers in 2020) and the highest number of opioid-related overdose deaths (n=861 in 2018-2019 and n=420 in 2020).
- The following occupations had opioid-related overdose death rates that were significantly higher than the rate for all Massachusetts workers in all occupations:
 - Building and Grounds Cleaning and Maintenance (116.3 deaths per 100,000 workers in 2018-2019; 177.6 deaths per 100,000 workers in 2020)
 - Construction and Extraction (272.8; 310.8)
 - Farming, Fishing, and Forestry (475.5; 654.9)
 - Food Preparation and Serving Related (81.9; 130.2)
 - Installation, Maintenance, and Repair (110.5; 117.2)
 - Personal Care and Service (67.7; 86.2)
 - Production (81.7; 92.2)
 - Transportation and Material Moving (68.3; 103.2)

Figure 5. Rate ratios of opioid-related deaths among Massachusetts working-age decedents by occupational groups, comparing 2018-2019 vs. 2020



† In 2018-2019, this category excluded 14 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 23 opioid-related overdose deaths because the death certificates did not contain enough information to code occupation ; In 2020, this category excluded 5 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 13 opioid-related overdose deaths because the death certificates did not contain enough information to code occupation.

‡ Rate ratios are the difference in opioid-related overdose death rates from 2018-2019 to 2020. If the rate ratio and confidence interval (CI) includes 1, it means there is no difference in the rates of 2018-2019 and 2020. If the rate ratio and CI favors the left (less than one) and does not include 1, it means the rate of 2018-2019 is statistically greater than the rate of 2020. If the rate ratio and CI favors the right (great than one) and does not include 1, it means the rate of 2020 is statistically greater than the rate of 2018-2019.

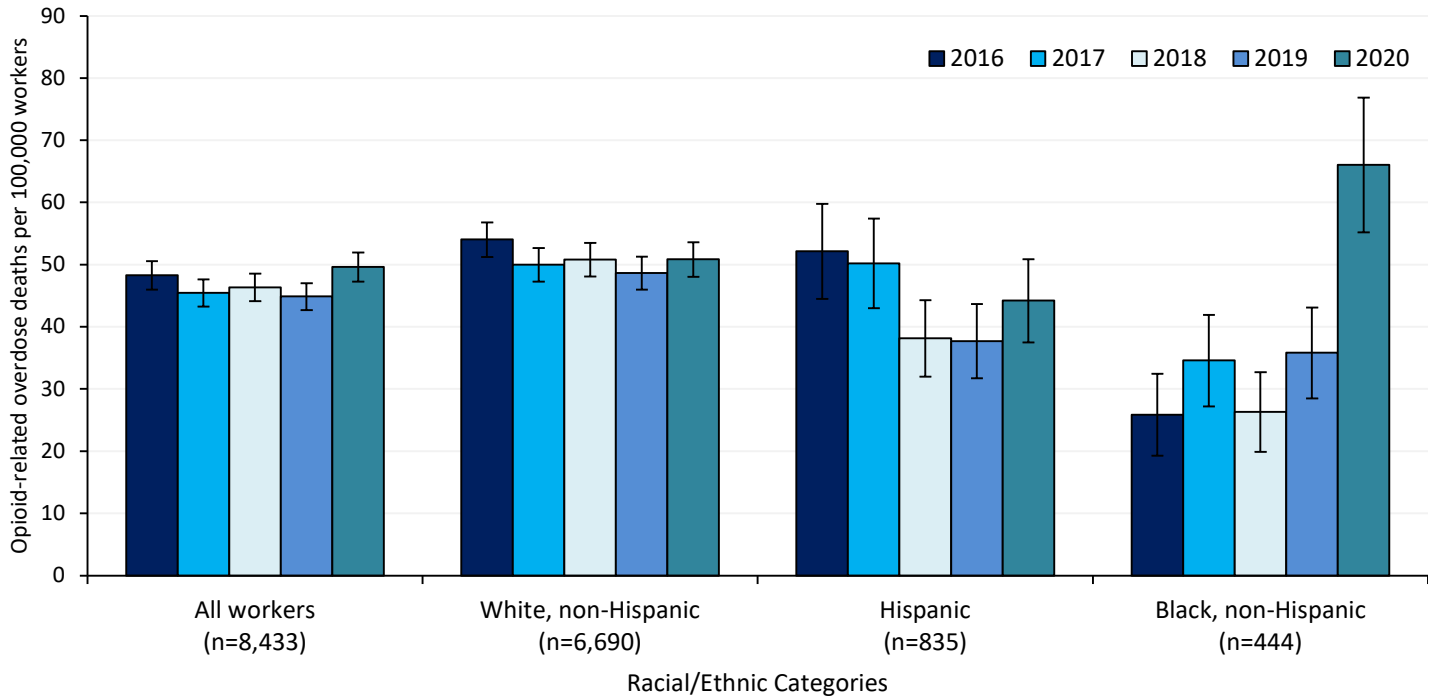
Numerator source: Massachusetts Registry of Vital Records and Statistics, 2018-2020
Denominator source: American Community Survey, 2018-2020

Compared to 2018-2019, the rate of opioid-related overdoses among Massachusetts workers in the following industries increased in 2020:

- Arts, Design, Entertainment, Sports and Media
- Building and Grounds Cleaning and Maintenance
- Community and Social Services
- Computer and Mathematical
- Construction and Extraction
- Farming, Fishing, and Forestry
- Food Preparation and Serving Related
- Healthcare Practitioner and Technical
- Healthcare Support
- Installation, Maintenance, and Repair
- Legal
- Life, Physical and Social Science
- Management
- Personal Care and Service
- Protective Service
- Sales and Related
- Transportation and Material Moving

Opioid-related Overdose Death Rates by Demographics

Figure 6. Rate of opioid-related deaths among Massachusetts working-age decedents by race/ethnicity, n=8,433



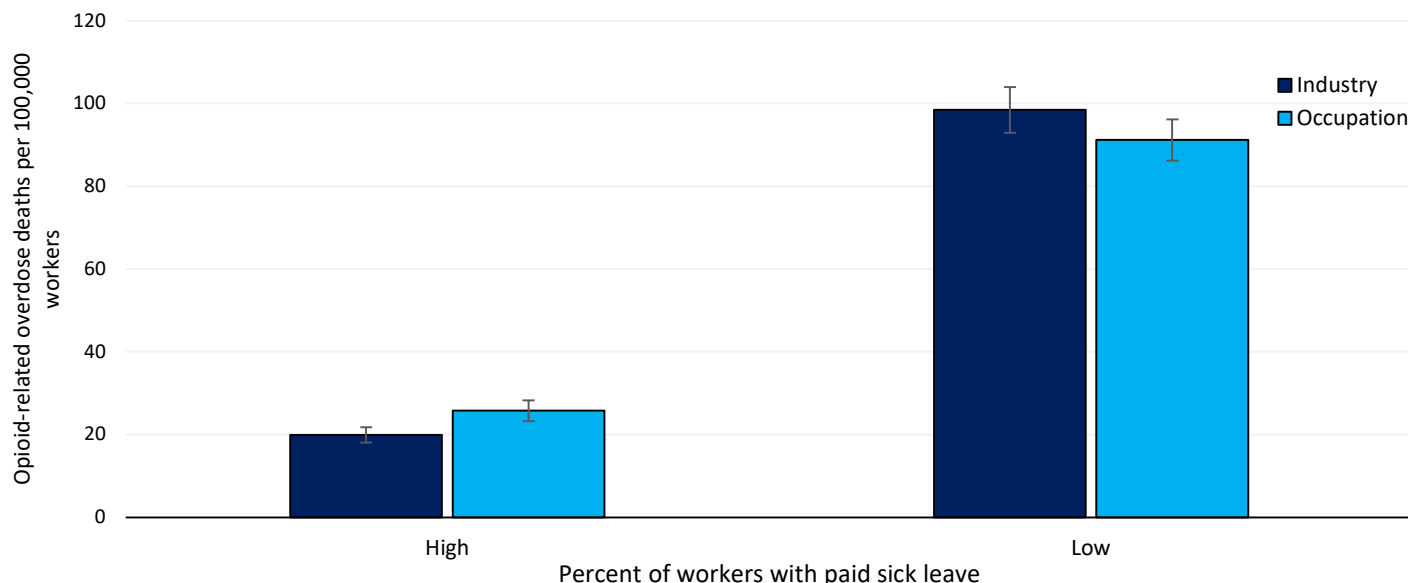
Numerator source: Massachusetts Registry of Vital Records and Statistics, 2016-2020
Denominator source: American Community Survey, 2016-2020

- Rates among workers by race/ethnicity were examined for each year during 2016-2020 (Figure 3). The rate for white, non-Hispanic workers has decreased slightly from 2016 to 2017 but remained relatively stable, which is similar to the pattern for all workers. However, the rate among Hispanic workers decreased from 2016 to 2019 and increased in 2020. The rate among Black, non-Hispanic workers fluctuated between 2016 to 2020.
- The rate for all racial/ethnic groups increased in 2020, however, the rate for Black, non-Hispanic workers nearly doubled in 2020 compared to previous years. This same jump was seen overall in state-wide deaths.⁷ This elevated rate highlights the need for prevention approaches that center equity and authentically engage the perspectives of Black workers.
- Among Black, non-Hispanic workers, the top five occupation groups with rates of opioid-related overdose deaths that were significantly higher than the rate for all occupations were:
 - Construction and extraction (711.7 deaths per 100,000 workers)
 - Building and Grounds Cleaning and Maintenance (303.5)
 - Personal Care and Service (204.6)
 - Food Preparation and Serving Related (194.5)
 - Sales and Related (135.6)
- Due to low numbers of opioid-related overdose deaths among other racial and ethnic groups in the examined time period, it was not possible to generate rates for Asian/Pacific Islander, non-Hispanic working-age decedents (n=53) and American Indian/Alaska Native, non-Hispanic working-age decedents (n=22).
- It is important to note, using data from 2016-2020, the rate for Hispanic, and Black, non-Hispanic working-age decedents may be underestimated because the death certificates among these racial/ethnic groups were more likely to have missing industry and occupation information and therefore, as mentioned below in the Methods section, these death certificates were excluded from the analysis.

⁷ Opioid-Related Overdose Deaths, All Intentions, MA Residents – Demographic Data Highlights. Massachusetts Department of Public Health. June 2022. <https://www.mass.gov/doc/opioid-related-overdose-deaths-demographics-june-2022/download>

Opioid-related Overdose Death Rates by Access to Paid Sick Leave

Figure 7. Rate of opioid-related deaths among Massachusetts working-age decedents by percentage of workers by availability of paid sick leave, n=1,736*



*The industry category excluded 5 opioid-related overdose deaths among those working in the military or military specific occupations due to lack of denominator information and 13 opioid-related overdose deaths because the death certificates did not contain enough information to code industry. The occupation category excluded from the opioid-related overdose death rate calculation were 33 deaths among those working in the military or military-specific occupations and 51 deaths which lacked information about paid sick leave and/or had insufficient sample size to calculate access to paid sick leave
Paid sick leave categories (High, Low) were derived from Massachusetts data from the COVID-19 Community Impact Survey. An Industry sector was considered to have high availability of paid sick leave if 82.2% or more of Survey respondents within that industry sector reported having access to paid sick leave. All other industry sectors were categorized as having low availability of paid sick leave. An Occupation group was considered to have high availability of paid sick leave if 82.5% or more of Survey respondents within that occupation group reported having access to paid sick leave. All other occupation groups were categorized as having low availability of paid sick leave.
Numerator source: Massachusetts Registry of Vital Records and Statistics, 2020
Denominator source: American Community Survey, 2020

In Massachusetts, workers may use sick time if they are injured, ill or have a routine medical appointment.⁸ They can also use this time for their child, spouse, parent, or spouse's parent for the same purposes. Additionally, workers may use this time to deal with domestic violence involving themselves or their children. Employers with 11 or more employees must provide **paid** sick time. Employers with fewer than 11 employees must provide **earned** sick time, *but it does not need to be paid*. Eligibility is not based on the number of hours worked; the Earned Sick Time Law applies to part-time, full-time, temporary, seasonal, and other employees. The Massachusetts Earned Sick Time Law went into effect in July 2015 and was implemented in 2016.

If paid sick leave is unavailable, a worker may decide to work while in pain, which may increase reliance on pain medication, including opioids. As shown in Figure 4, industry sectors and occupation groups were categorized as having either a high or low percentage of workers with paid sick leave, based on data from the Massachusetts COVID-19 Community Impact Survey (CCIS), a survey conducted in the fall of 2020 of over 30,000 MA residents, that aimed to better understand the biggest health needs facing people living in Massachusetts during the pandemic.⁹ Respondents answered questions about their industry, occupation and availability of paid sick leave. In the CCIS, 82.2% of employed respondents across all industries and 82.5% of employed respondents across all occupations reported having paid sick leave. Based on these averages, we classified industry sectors and occupational groups as having high or low paid sick leave availability. An industry sector was considered to have high availability of paid sick if 82.2% or more of survey respondents within that industry sector reported having access to paid sick leave, while an occupation group was considered to have high availability of paid sick leave if 82.5% or more of survey respondents within that occupation group reported having access to paid sick leave. All other industry sectors and occupation groups were categorized as having low availability of paid sick leave.

The opioid-related overdose death rates were 4.9 and 3.5 times higher among industry sectors and occupation groups with low percentages of workers reporting paid sick leave in the CCIS compared to those with high percentages of workers with paid sick leave, respectively.

⁸ Office of Attorney General Maura Healey. Earned sick time. <https://www.mass.gov/info-details/earned-sick-time>

⁹ Massachusetts Department of Public Health (2021). COVID-19 Community Impact Survey. <https://www.mass.gov/info-details/covid-19-community-impact-survey?msclid=6d05cdddb9b611ecbf6e6f73ae48cd6d>

The following **industry sectors** were categorized as having a low percentage of workers covered by paid sick leave in CCIS:

- Construction
- Transportation and Warehousing
- Administration and Support and Waste Management Services
- Accommodation and Food Services
- Other Services, except Public Administration
- Arts, Entertainment, and Recreation
- Retail Trade
- Real Estate and Rental and Leasing

The following **occupation groups** were categorized as having a low percentage of workers covered by paid sick leave in the CCIS:

- Construction and Extraction
- Production
- Transportation and Material Moving
- Arts, Design, Entertainment, Sports, and Media
- Building and Grounds Cleaning and Maintenance
- Sales and Related
- Healthcare Support
- Food Preparation and Serving Related
- Personal Care and Service
- Education, Training, and Library

Methods

Opioid-related overdose deaths were identified by the causes of death listed on death certificates, which were available electronically through a file provided by the Massachusetts Registry of Vital Records. The following International Classification of Diseases – 10th edition (ICD-10) codes were selected from the underlying cause of death field to identify all fatal poisonings/overdoses, regardless of intent: X40-X49 (unintentional), X60-X69 (self-harm/suicide), X85-X90 & Y35.2 (assault/homicide/other) and Y10-Y19 (undetermined intent). Additionally, multiple cause of death fields were searched to identify fatal poisonings in which the substance involved was an opioid: T40.0 (opium), T40.1 (heroin), T40.2 (other opioids), T40.3 (methadone), T40.4 (synthetic narcotics), and T40.6 (other unspecified narcotics). Additional information obtained from the death certificates included decedent's age, sex, Race/ethnicity, residence, and usual industry and occupation. Occupation describes the kind of work and individual does to earn a living (i.e., job title), while industry describes the activities the individual's employer is engaged in. Using the National Institute for Occupational Safety and Health Industry and Occupation Computerized Coding System (NIOCCS), industry and occupation were assigned North American Industry Classification System (NAICS) codes and the Standard Occupation Classification System (SOC) codes, respectively, and were further classified by manual review. Since this analysis focuses on working-age Massachusetts residents who are employed, deaths among out-of-state residents, individuals not in the workforce either because they were homemakers, unemployed or had never been employed, unable to work due to disability or another reason, or were students were excluded. Additionally, deaths were excluded if death certificates lacked enough information to code either industry or occupation.

The distribution and rate of opioid-related overdose deaths among working-age Massachusetts residents was presented by industry and occupation. For 2018-2019, two-year average annual opioid-related overdose death rates and for 2020, one-year average annual opioid-related overdose death rates among working-age decedents were calculated as the number of deaths per 100,000 workers. 95% confidence intervals were calculated for all rates. For brevity in this data brief, all average annual rates, whether two-year or one-year, are referred to as just rates. Joinpoint regression was used to identify segments of time when the rate of opioid-related overdose deaths among Massachusetts working-age decedents changed from 2011 to 2020. Data on the average annual number of workers employed in Massachusetts between 2011 and 2020 were obtained from the American Community Survey, 2011-2020 and served as the denominator for rates.

As noted above, using Massachusetts data from the COVID-19 Community Impact Survey, occupation groups were categorized according to the availability level (high or low) of paid sick leave, based on the Massachusetts total of respondents. An industry sector was considered to have high availability of paid sick if 82.2% or more of survey respondents within that industry sector reported having access to paid sick leave, while occupation was considered to

have high availability of paid sick leave if 82.5% or more survey respondents within that occupation reported having access to paid sick leave. An industry sector was considered to have low availability of paid sick leave if less than 82.2% of survey respondents within that industry reported having access to paid sick leave, while an occupation was considered to have low availability of paid sick leave if less than 82.5% of survey respondents within that occupation reported having access to paid sick leave.

Data Sources:

- *Opioid-related overdose deaths:* Death certificates provided by the Massachusetts Registry of Vital Records, Massachusetts Department of Public Health (MDPH)
- *Denominators for rates:* American Community Survey (ACS): United States Census Bureau, U.S. Department of Commerce
- *Paid sick leave estimates:* COVID-19 Community Impact Survey, Massachusetts Department of Public Health (MDPH)

Statistical Significance: The 95% confidence interval (95% CI) is a range of values determined by the degree of variability of the data within which the true value is likely to lie. The confidence interval indicates the precision of a calculation; the wider the interval, the less precision in the estimate. The 95% confidence intervals used in this report for crude rates are the indicators of reliability (or stability) of the estimate. Smaller population subgroups or smaller numbers of respondents yield less precise estimates