THE MASSACHUSETTS OPIOID EPIDEMIC

An Issue of Substance

Massachusetts Taxpayers Foundation

ABOUT MTF

Since its founding in 1932, the Massachusetts Taxpayers Foundation (MTF) has been widely recognized as the state's premier public policy organization focused on state and local fiscal, tax and economic policies. Our mission is to provide public and private sector decision makers with unbiased research and constructive solutions that drive public policy in order to strengthen the state's finances and position the Commonwealth for long-term growth.

MTF's record of high-quality research and non-partisan analysis has earned it broad credibility on Beacon Hill and across the Commonwealth. This untarnished credibility has allowed MTF to have a significant impact on a wide range of issues – from health care, business costs and transportation funding to tax competitiveness, capital investments and state and local finances.

rize massachusetts

Funded by a grant from

RIZE Massachusetts

ABOUT RIZE MASSACHUSETTS

RIZE Massachusetts is an independent nonprofit committed to achieving zero stigma and zero deaths related to opioid use disorder by investing in the best solutions and brightest minds that will save lives, reduce harm, and end the opioid overdose epidemic in Massachusetts.

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November 2018

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THE PURPOSE OF THIS REPORT

The growing opioid crisis is one the most complex challenges facing health care professionals, government, business, community leaders and families today. The state and federal impacts and policy implications of this epidemic are overwhelming. The dedicated people, organizations and agencies who are fighting this crisis on many fronts throughout the country and the Commonwealth tirelessly seek solutions to this multidimensional problem where the human toll is incalculable.

The Massachusetts Taxpayer's Foundation (MTF) believes that all segments of our society must rally together to reverse the trends and relieve the human suffering and economic burden of this expanding epidemic.

One way to increase cohesion and focus among all stakeholders in this battle is to provide a comprehensive picture of the size and scope of this epidemic. This report endeavors to accomplish this by measuring the drag on the Commonwealth's economic growth and by quantifying the costs to employers, health care providers, and state and municipal budgets trying to cope with the consequences of opioid addiction.

Few studies have calculated these economic and fiscal costs at the state level, in part because the research is extremely complex with insufficient data to feel overly confident about the numbers in any given year. But when we make solid estimates and order-of-magnitude calculations, we can begin to understand the economic scale and scope of the problem and can see clearly that the trends are ominous.

We've conducted this research for many reasons, but primary among them is to motivate greater involvement in this surging crisis among business leaders. As this report shows, the opioid crisis is having an enormous economic impact on businesses. Massachusetts business leaders must be a part of the discussion and solution about how we collectively address this societal crisis.

We also hope this report can serve as a reference point for further studies here and in other states. For that reason, we provide detailed information about our methodology and sources of data. We welcome future studies to fill in the holes we were unable to address in order to produce an even more comprehensive outlook and expand the findings as we collectively seek ways to curtail this crisis.

A Note of Thanks

Thanks to the dozens and dozens of experts who took the time to share their knowledge and experiences to instruct and guide this report. Without your assistance, this effort could not have been successfully undertaken. Special thanks to those who provided comments and critiques of earlier drafts. Your input greatly improved this report.

We are extremely grateful to RIZE Massachusetts for their financial support and ongoing coordination to make this report a reality. Despite the care in our use of methods and data to calculate the economic losses and excess costs in this report, there are certain to be errors – and they are ours.

Andrew R.C. Bagley
Author

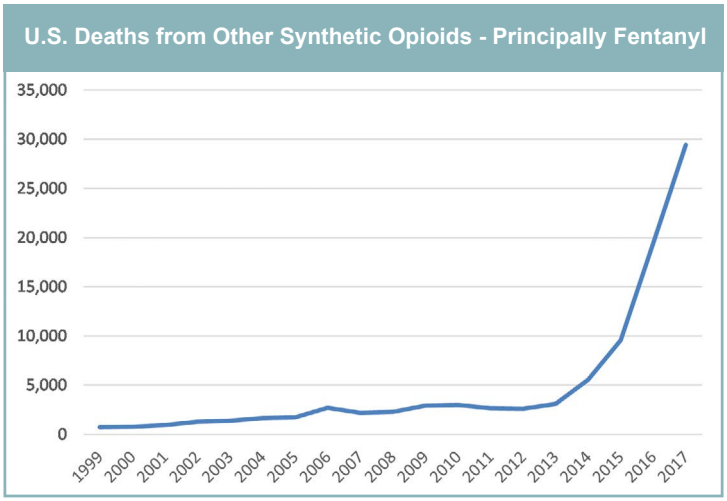
Eileen P. McAnneny
President

KEY FINDINGS

The Opioid Epidemic Is Far from Over – and It Will Probably Get Worse

The opioid crisis is an epidemic that has moved to the third and deadliest wave to date, characterized by a transition from heroin to fentanyl and fentanyl-related substances. With the arrival of carfentanil and other fentanyl-related analogs, opioids that are 100 times more potent than fentanyl and 5,000 times more potent than heroin, the risks are significantly amplified.

To make matters worse, fentanyl and fentanyl-related analogs are shipped to the U.S. in minute amounts through the U.S. Postal Service or commercial couriers, making them virtually undetectable by authorities. That fact, combined with fentanyl's potency and astronomical profit margins, are driving its spread across the U.S.



The number of fentanyl-related deaths soared from 2,628 in 2012 to 29,406 in 2017, a ten-fold jump in just five years. Deaths from fentanyl represented 60 percent of all opioid-related deaths in the U.S. in 2017, up from 11 percent in 2012.

If this trend continues over the next several years and if authorities are unable to sufficiently curb the supply of these super-potent opioids, the costs to families, communities and the state will be almost unimaginable.

Massachusetts Remains at the Epicenter of the Epidemic

Massachusetts has one of the highest opioid-related death rates in the country, trailing only Ohio, New Hampshire and West Virginia. Despite numerous policy changes, Massachusetts remains in a highly vulnerable position.

Fentanyl-related deaths in the state reached nearly 90 percent of all opioid-related deaths in the second quarter of 2018. Fentanyl is now routinely mixed with cocaine, prescriptions purchased on the street, and other illicit drugs without the user's knowledge of its potency, leading to higher risks of overdose and death.

In just two raids in 2018, authorities in Massachusetts seized 25 kilos of fentanyl, more than enough to kill the state's entire population. It is nearly impossible to control the supply of opioids permeating the state. And, as the potency of these drugs increase, more lives will be at risk. Massachusetts has been a leader among states in the fight against opioids, out in front of other states that are beginning to see a surge in drug use overdoses and deaths, and yet the impact of the opioid epidemic has not abated here."

The Impact of Opioids on Businesses Is Significant

The ongoing opioid epidemic is keeping tens of thousands of prime age people from participating in the workforce. Furthermore, nearly 150,000 employed people or 4 percent of those who have a job report that they misused prescription pain relievers over the previous year.

The impacts on businesses are severe and growing. Lost productivity from absenteeism and presenteeism is likely more than $2.5 billion annually. That figure is in addition to excess health care costs related to opioid usage, estimated to exceed $2 billion.

But most importantly, the difficulty in filling open positions during this period of sustained economic growth is exacerbated by the opioid crisis. For example, the state recently experienced the unusual situation of having more jobs available than unemployed people. When people suffering from opioid addiction either have no attachment to the workforce or are less productive, the problem becomes more pronounced.

Lost productivity from absenteeism and presenteeism is likely more than $2.5 BILLION annually.

Massachusetts employers are already facing demographic challenges that are made worse by the opioid epidemic. Our birth rate is among the lowest, if not the lowest, in the country and the population is aging faster than the rest of the U.S. International immigration, which has been critical to our economic growth for a decade or more, is now at risk. In 10 years, Massachusetts will have an estimated 200,000 fewer work-aged people (16 and 64).

The tens of thousands more prime age people lost to the workforce due to the opioid crisis is yet another stiff headwind businesses must overcome in order to expand and prosper.

The Fiscal Costs of the Opioid Epidemic Are Enormous – and Growing

The financial burden to the state from lost productivity, increased health care costs, and increased expenses for public safety and criminal justice from the opioid crisis are in the billions of dollars. The snapshot numbers in 2017 are disquieting enough, but the trends are even more concerning.

The cost of lost productivity from those who are unable to work due to opioids, those who have died from overdoses, and those whose productivity is compromised by having to manage their own opioid-addiction while working reached approximately $9.7 billion in 2017.

Health care costs related to the opioid crisis including excess costs to businesses, MassHealth and other state programs, and health care providers reached $4.5 billion in 2017. But this understates the true costs. For example, this estimate does not include follow-up health care

for infants and children with Neonatal Abstinence Syndrome (NAS), nor does it include the increasingly expensive costs for care of injection-related medical complications that includes HIV/AIDS, Hepatitis B, Hepatitis C, Endocarditis, and skin, soft tissue and joint infections.

Criminal justice and public safety costs are estimated at approximately $500 million and $550 million respectively in 2017, but these figures are likely understated. Many detainees and prisoners are arrested or imprisoned based on charges that are not drug charges but are in fact substance-related, such as acquisitive crimes like theft and prostitution, or for a crime committed while under the influence of substances.

Not included in this report are the additional costs to the state and communities to pay for early intervention and support for families affected by substance use disorder. Also not included are the additional costs to the Division of Families and Children and foster care due to the number of parents struggling with the addiction and unable to properly care for their children.

WHAT *WAS* A CRISIS IS *NOW* AN EPIDEMIC

Over the past two decades, the opioid crisis has transformed into a public health crisis that the Centers for Disease Control and Prevention (CDC) labels a national epidemic. The CDC estimates that opioid-related deaths surpassed 49,000 in the U.S. in 2017, six-times higher than in 1999. Opioid overdose deaths now exceed deaths from motor vehicle accidents and firearms in the United States and are the leading cause of death for those under the age of 50. Further, the death toll is likely far larger than government records indicate[1] and may not peak for years to come.[2]

This epidemic knows no geographic or social boundaries. The scourge crisscrosses cities and towns of all sizes and kinds, striking families throughout the state and the nation. The impacts are everywhere. According to a Pew Survey, nearly half (46 percent) of Americans have a family member or friend who is or has been addicted to drugs.[3] A 2018 poll conducted for Blue Cross Blue Shield of Massachusetts found that a majority of people in the state know someone who has overdosed, and three-in-ten know someone who has died from an overdose.[4]

The CDC estimates that opioid-related deaths surpassed 49,000 in the U.S. in 2017.

The Third Wave – Deadliest to Date

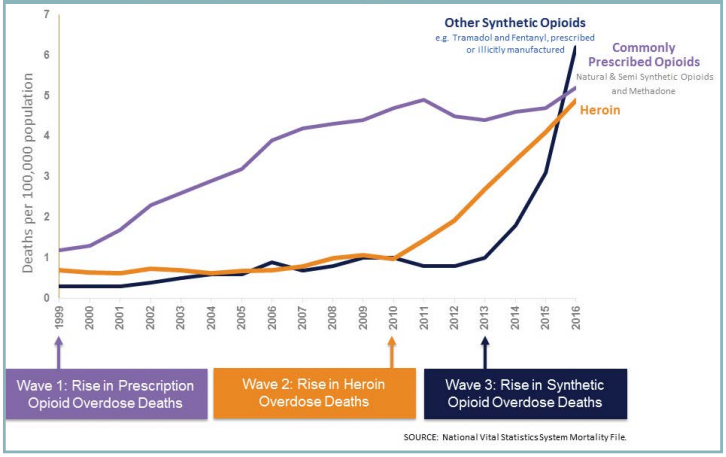
Due to the evolving nature of opioid usage, it has been difficult for policymakers to keep pace with mitigation efforts. There have been three distinct phases to the epidemic, each one more deadly than the last.

From 1999 to 2017, over 400,000 people died from an opioid overdose in the United States. These deaths fall into three waves (Figure 1). The first wave began in the 1990s with the accelerated use of opioids to treat moderate-to-severe pain. This phase was driven by a concurrent four-fold increase in opioid prescriptions, including oxycodone and hydrocodone, and resulted in a four-fold increase in deaths from 3,442 in 1999 to 14,583 in 2010.[5]

The second wave was characterized by an emergent transition from opioid prescriptions to heroin, due in part to its cheaper price relative to prescriptions on the street. Heroin, a more potent and widely available alternative opioid with a perceived "better high," became a substitute drug for people with untreated addictions.[6]

This shift quickened in 2010 when the Food and Drug Administration (FDA) took action against opioid prescription misuse by approving a reformulated, abuse-deterrent version of OxyContin. This new version was difficult to crush or dissolve, thus discouraging misuse through ingestion, insufflation, or injection. These interventions "were associated with sudden, substantial, and sustained decreases in prescription opioid dispensing."[7]

Figure 1: Three Waves of the Opioid Crisis[8]



Several reports examined the switch to heroin as a substitute for abuse-deterrent prescriptions. One study concluded, "Our results imply that a substantial share of the dramatic increase in heroin deaths since 2010 can be attributed to the reformulation of OxyContin."[9]

A second study quoted this typical response from interviews with people who misused OxyContin:

> "Most people that I know don't use OxyContin to get high anymore. They have moved on to heroin [because] it is easier to use, much cheaper, and easily available."

These authors concluded that "there was no evidence that OxyContin abusers ceased their drug abuse as a result of the abuse-deterrent formulation. Rather, it appears that they simply shifted their drug of choice."[10]

As deaths from opioid prescriptions plateaued, heroin-related deaths (without other synthetic opioids) quintupled in the U.S. from 3,036 in 2010 to 15,958 in 2017[11], demonstrating the deadly consequences of this transition to heroin.

The third wave began in 2013 when we saw a dramatic spike in deaths from highly potent synthetics such as fentanyl and fentanyl-related substances such as carfentanil. Fentanyl is 50 times more potent than heroin, while carfentanil is 100 times more potent than fentanyl and 5,000 times more potent then heroin. As little as 0.2 mg of carfentanil, about the size of a grain of sand, can be deadly (Figure 2).

Figure 2: Lethal Doses of Heroin, Fentanyl and Carfentanil[12]

Illicit fentanyl, sometimes manufactured to look like other prescription medicine such as Norco or Xanax, or alternatively mixed with heroin or cocaine, triggered a massive spike in deaths due to its extreme potency. Deaths from synthetic opioids (other than methadone) grew a staggering 900 percent in just four years from 3,105 in 2013 to 29,406 in 2017.[13]

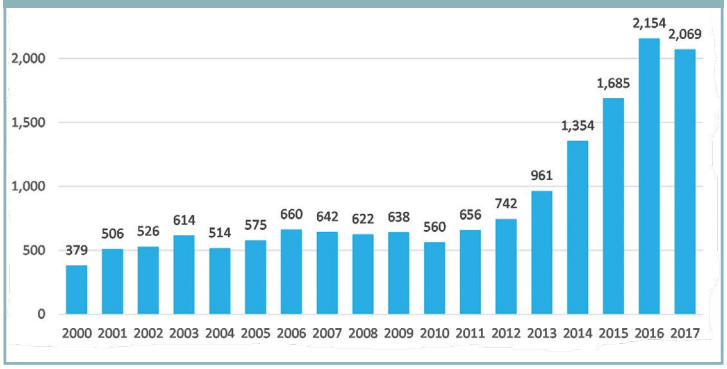
In particular, carfentanil and other fentanyl analogs place an ever-increasing number of people at risk. For the 12-month period between June 2016 and 2017, 2,275 of the 11,045 people who died from opioid overdose in the U.S. tested positive for a fentanyl analog, with 1,236 testing positive for carfentanil.[14] Ohio reported 340 deaths involving carfentanil during the last six months of 2016[15] and Florida reported 552 carfentanil-related deaths for the year.[16]

Deaths from synthetic opioids (other than methadone) grew a staggering 900% in just four years.

Massachusetts – at the Epicenter of the Epidemic

In 2016, Massachusetts had the fourth highest rate of opioid-related deaths in the nation at 30.2 per 100,000 of population, trailing only Ohio (33.6), New Hampshire (36.3) and West Virginia (45.2). Opioid-related deaths nearly quadrupled during the second and third waves in Massachusetts, increasing steadily from 560 in 2010 to 2,154 in 2016, before declining slightly in 2017. This surge followed a decade where annual opioid-related deaths averaged 570 and never exceeded 660 (Figure 3). Put another way, opioid-related deaths grew in Massachusetts at an average annual rate of 4.8 percent from 2000 to 2010 before soaring to 47.8 percent average annual growth from 2010 to 2016 – a stunning ten-fold increase.

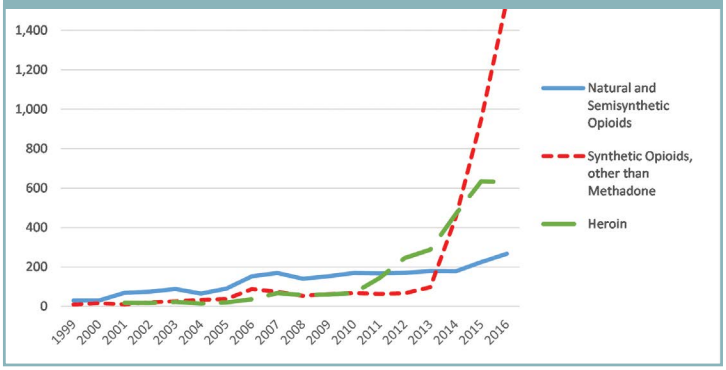
Figure 3: Massachusetts Opioid-Related Deaths, 2000-2017



The driving force behind this dramatic increase in opioid-related deaths was the increased use of heroin followed by the growing prevalence of fentanyl and other non-methadone synthetics.

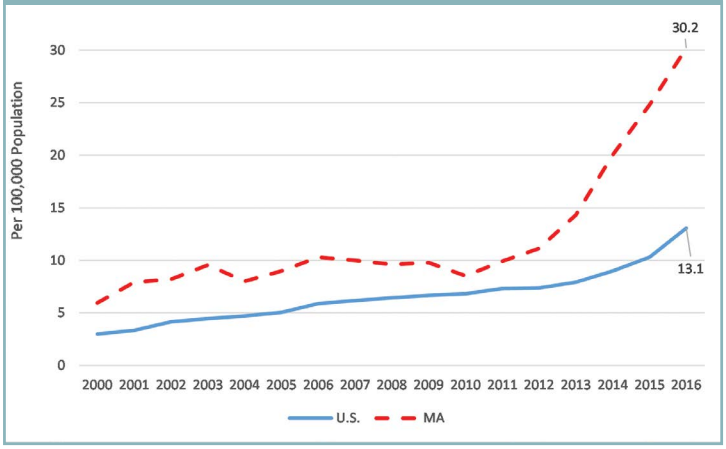
As shown in Figure 4, heroin-related deaths in Massachusetts jumped ten-fold from 64 in 2010 to 634 in 2016, while illicit synthetic opioid-related deaths soared from 98 in 2013 to 1,550 in 2016, a 1,580 percent increase in just three years.[17] According to the U.S. DEA, Massachusetts had the second highest number of fentanyl-related seizures and arrests in 2016, trailing only Ohio.

Figure 4: Overdose Deaths by Type of Opioids in Massachusetts, 1999-2016[18]



Although the rate of increase in opioid-related deaths in Massachusetts was similar to the rate in the U.S. from 1999 to 2010, deaths from heroin and fentanyl have accelerated at a far faster pace here than the country as a whole in the years since then. In 2016, Massachusetts' opioid-related death rate of 30.2 per 100,000 of population was 2.3 times greater than the U.S. average of 13.1 (Figure 5).

Figure 5: Opioid-Related Deaths per 100,000 Residents: Massachusetts vs. U.S.



In response to the growing crisis, Massachusetts enacted a number of important reforms, such as expanded Medicaid benefits for addiction care, increased access to naloxone, reduced opioid prescriptions, and increased access to a range of treatments and recovery supports. These changes helped achieve the modest reduction in the number of opioid-related deaths in Massachusetts in 2017 (previously shown in Figure 3).

A Fragile Pause?

The state has also successfully reduced the number of opioid prescriptions written in the Commonwealth. According to a recent Blue Cross Blue Shield Association study of its 41 million commercially insured members, Massachusetts saw a 51 percent decline in opioid prescriptions from 2013 to 2017, the largest drop in the nation.[19] Data from the Massachusetts Prescription Monitoring Program shows that opioid prescriptions fell 30 percent from 868,000 in 2015 to 580,000 in 2018.[20]

But progress in this crisis could be fleeting.

Massachusetts is susceptible to a continued expansion of the epidemic because we have high instances of two of the underlying causes – the problems of hopelessness, isolation and despair[21], and increased access to riskier drugs[22].

People with substance use disorders and those who suffer from depression or suicidal ideation have higher risk factors for opioid misuse (see for example, ***Preventing Prescription Drug Misuse: Understanding Who Is at Risk***, SAMHSA's Center for the Application of Prevention Technologies, May 2016). These findings suggest that people with chronic or acute pain who are frequent users of tobacco, alcohol, or marijuana in combination with mental illness, depression, anxiety or despair, have a greater likelihood of non-medical use of prescription drugs.

Massachusetts data highlights a significant population at risk for opioid misuse. As Table 1 shows, Massachusetts has a high number of people reporting mental health issues (231,000), suicidal thoughts (212,000) or depressive episodes (467,000). When these statistics are viewed in the context of the number of people who binge on alcohol (1.6 million), report a substance use disorder (574,000), or need but are not receiving treatment for substance use (490,000), it is clear that the epidemic could continue to spread at any time.

Table 1: Massachusetts Drug Use and Health Statistics, 2015-2016[23]
(in thousands)

MA - Annual Averages Based on 2015 and 2016 NSDUHs	12-17 Estimate	18 or Older Estimate
Pain Reliever Misuse in the Past Year	14	214
Binge Alcohol Use in the Past Month	31	1,633
Tobacco Product Use in the Past Month	23	1,171
Cigarette Use in the Past Month	15	960
Alcohol Use Disorder in the Past Year	12	426
Substance Use Disorder in the Past Year	22	552
Needing But Not Receiving Treatment for Illicit Drug Use in the Past Year	15	169
Needing But Not Receiving Treatment for Substance Use in the Past Year	22	490
Serious Mental Illness in the Past Year		231
Had Serious Thoughts of Suicide in the Past Year		212
Major Depressive Episode in the Past Year	67	400

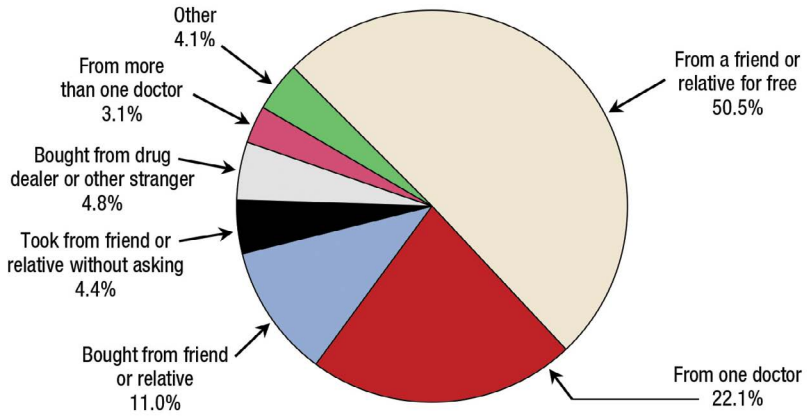
Difficulty Controlling the Supply of Opioids

These concerns are heightened by the fact that controlling the supply of opioids – particularly illicitly manufactured fentanyl – poses a herculean challenge.

Initial supply efforts focused on controlling the 1.13 billion opioid prescriptions dispensed between 2013 and 2017, where the cache of unused pills was of greatest concern.[24,25]

A recent review of six studies found that between 67 and 92 percent of patients who underwent a surgical procedure reported between 42 percent and 71 percent of prescribed opioid tablets go unused. Further, there were low rates of disposal and few put the opioids in locked storage.[26] Unsurprisingly, as shown in Figure 6, friends and relatives were the predominant source of pain relievers, supplying two-thirds of all misused prescriptions in 2013 and 2014.

Figure 6: Source of Prescription Pain Relievers Misused[27]



Source: SAMHSA Center for Behavioral Health Statistics and Quality, National Surveys on Drug Use and Health (NSDUHS). 2013-2014

Controlling the supply of fentanyl and related synthetics is even more challenging than prescriptions, as synthetics can be purchased on the dark web and shipped to the U.S. in quantities that are practically undetectable.[28] The fact that fentanyl was present in 90 percent of opioid-related fatalities in 2018 in Massachusetts demonstrates the deadly nature of synthetic opioids where users cannot know the potency of the drugs they consume.

Large-scale outbreaks reveal the far-reaching potential impact of these substances. A bad batch of fentanyl or fentanyl-related derivatives can overwhelm first responders and quickly drive up the death toll. Recent incidents in West Virginia, Ohio and Connecticut provide chilling glimpses of such mass casualty events:

- **Huntington, WV, August 2016**
  20 people overdosed from carfentanil-laced heroin in a four-hour period.[29]
- **Cincinnati, OH, August 2016**
  174 people overdosed from heroin cut with carfentanil in six days.[30]
- **New Haven, CT, August 2018**
  100 people overdosed in a 36-hour period, overwhelming first responders.[31]

Recent drug seizures give an indication of the severity of the problems confronting authorities. In May 2018, federal agents found 1.7 grams of carfentanil and fentanyl gel tabs in a California home[32], enough for 86,000 lethal doses. That same month, New York City Police charged three individuals with attempting to distribute 100 grams of carfentanil, which could kill up to five million people.[33] In January 2018, authorities in New Jersey confiscated 45 kilograms of fentanyl, enough to kill 18 million people or the populations of New York City and New Jersey combined.[34] In two raids in 2018, authorities in Massachusetts seized 25 kilos of fentanyl, more than enough to kill the state's entire population.[35]

It is clear that vast quantities of opioids with increasing potency are flooding the state and the country. The epidemic has not stalled; in fact, it is poised to accelerate with alarming consequences to our people, our communities, and the health of the state's economy.

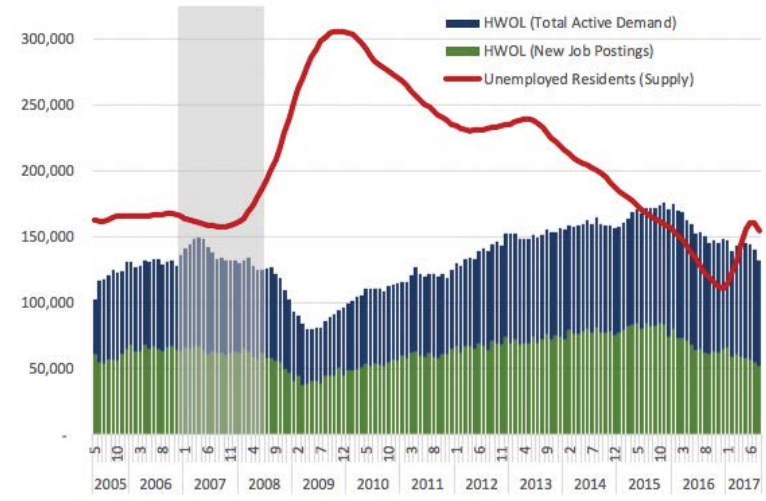
WHY THIS MATTERS TO BUSINESSES: SHORTAGE OF WORKERS

Beyond the human toll of the crisis, which is not to be minimized, the opioid epidemic should be a significant concern to employers because it threatens to exacerbate the difficulty businesses already confront in finding and keeping employees.

Across the county, the unemployment rate has reached historic lows and the number of job openings in the U.S. has climbed to 6.9 million – a new high mark.[36] Many of these jobs will go unfilled as businesses struggle to find workers.

In Massachusetts, significant long-term demographic challenges already threaten to constrain economic growth. Rapid economic expansions and recoveries have driven the state's unemployment rate to 3.5 percent in 2018, below the national average and the lowest figure since April 2001. On top of that, for much of 2015 - 2017 there were more jobs available in Massachusetts than unemployed residents (Figure 7), a highly unusual and frustrating situation for companies seeking qualified workers.

Figure 7: Labor Supply vs. Labor Demand – Massachusetts Seasonally Adjusted Data[37]



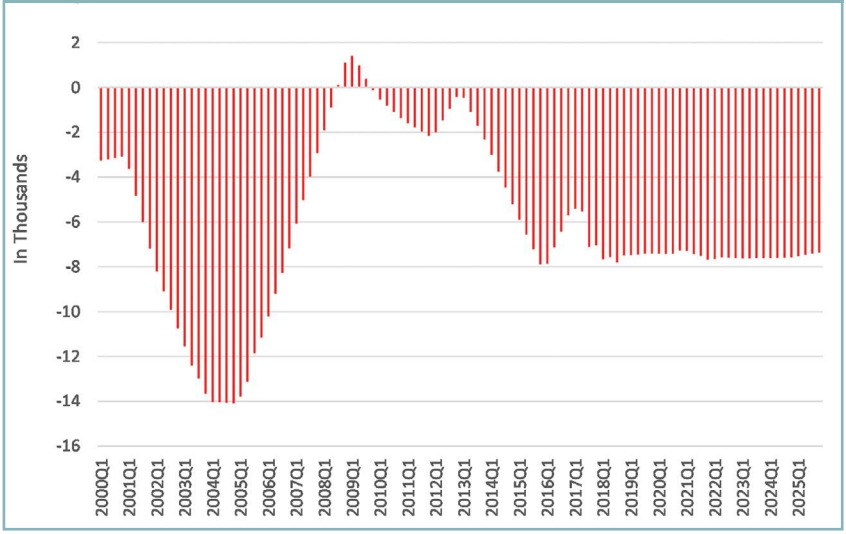
Source: The Conference Board's Help Wanted On Line (HWOL), BLS, LAUS

In addition, as with many developed countries, the state's birth rate continues to fall. The total fertility rate (TFR) in Massachusetts, that is, the lifetime number of births per woman, estimated at 1.55 in 2015[38], is one of the lowest in the U.S. and is well below the 2.01 replacement level. A low fertility rate reduces the size of the future workforce and leads to a higher proportion of older citizens.

And the number of older citizens in Massachusetts is rising quickly. In 2018, 16.3 percent of the state's population is 65 years of age or older, up from 13.3 percent in 2008. According to projections, that upward trend will continue with one in five Massachusetts residents aged 65 or older by 2026.

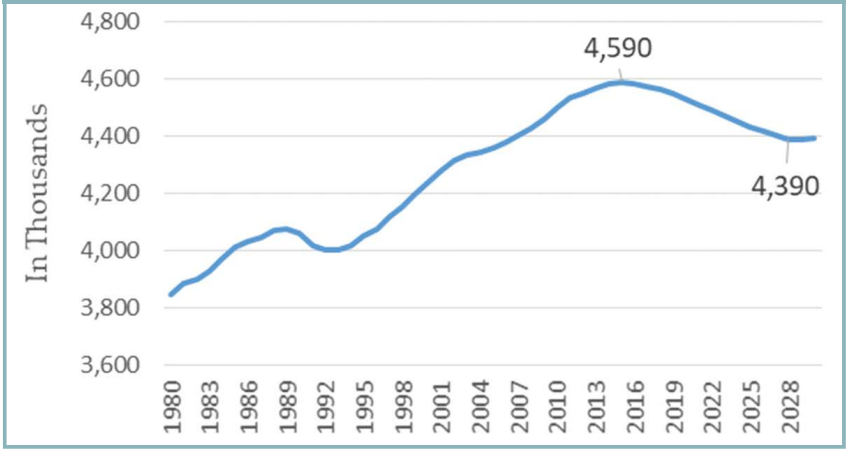
Furthermore, Massachusetts has suffered a loss of 400,000 in net domestic migration between 2000 and 2017 and the trend is expected to continue for at least the next decade (Figure 8).[39]

Figure 8: Massachusetts Domestic Migration



Collectively, these challenges place significant barriers to business expansion. As shown in Figure 9, the number of work-aged people (age 16 – 64) peaked in 2015. By 2028, the state will have 200,000 fewer work-aged people, thereby reducing employers' ability to find workers with skills vital to growth.

Figure 9: Massachusetts Population Aged 16-64,1980-2030[40]



Against this already-challenging backdrop, businesses must navigate the growing impact of the opioid crisis on the workforce. As covered later in this report, opioids have kept an estimated 32,700 people from participating in the labor force in Massachusetts over the past seven years. Another 143,000 who have a job (4.2% of total employed in the state) reported pain reliever misuse and average an extra 18 more days off from work than those who do not misuse prescription pain medications. Of adults who report misuse of pain medication in the previous month, 68 percent are in the workforce.[41]

Opioids have kept an estimated 32,700 people from participating in the labor force in Massachusetts over the past seven years.

At a national level, prominent commentators on the U.S. economy have become increasingly alarmed about the epidemic's impact on the country's workforce:

- In her July 2017 testimony before the Senate on the impact of the opioid epidemic, former Federal Reserve Chair Janet Yellen stated: "I do think it is related to declining labor force participation among prime-age workers."[42]
- In July 2018, current Federal Reserve Chair Jerome Powell told a Senate committee that the opioid crisis is having "a terrible human toll on our communities and also it matters a lot for the labor force participation rate and economic activity in our country".[43]
- In the July 2017 Beige Book (the Federal Reserve Board's Summary of Commentary on Economic Conditions), the Federal Reserve Bank of Minneapolis conveyed that "Manufacturing contacts in Louisville and Memphis reported difficulties finding experienced or qualified employees, with some citing candidates' inability to pass drug tests or to consistently report to work."[44]
- After surveying eight Business Advisory Council (BAC) members on the impact of the opioid epidemic, the Federal Reserve Bank of Cleveland reported, "Approximately half of the members of our BACs noted that the opioid epidemic was negatively impacting their businesses directly or indirectly."[45]

The connection between opioid use disorder and the labor force was explored in a 2017 publication entitled "Where Have All the Workers Gone?" An Inquiry into the Decline of the U.S. Labor Force Participation Rate" by Alan Krueger, Professor of Economics and Public Affairs at Princeton University and former Chairman of the Council of Economic Advisors.

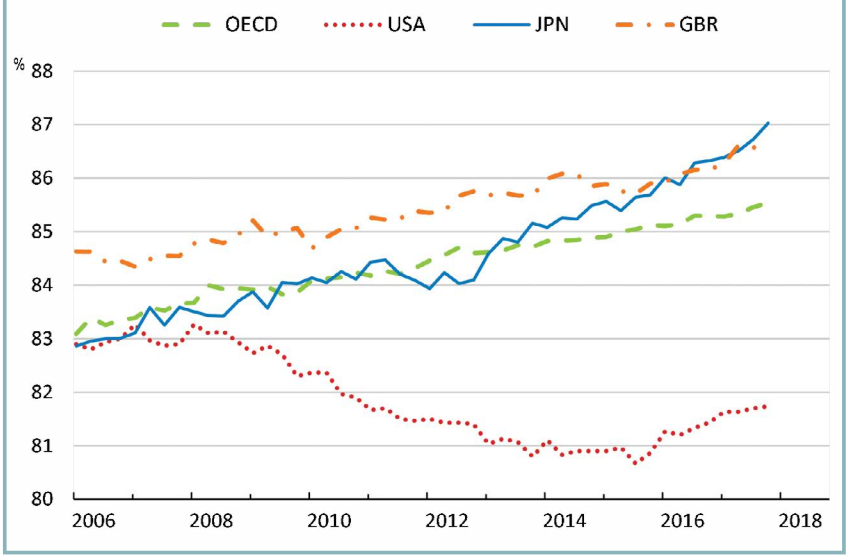
In analyzing the long-term trends in the nation's labor force participation rate, Krueger discovered that the participation rate fell more in areas where there was a higher volume of opioid pain medication prescriptions. This data was particularly strong for prime age (25-54) males where nearly half of those not in the labor force took pain medication daily, two-thirds of which were prescription painkillers.[46]

The OECD attributes the U.S. DECLINE IN LABOR FORCE participation to the growing opioid crisis.

Krueger's study concluded that the rise in opioid prescriptions from 1999 – 2015 could account for a 20 percent reduction in prime age male and a 25 percent reduction in prime age female participation in the labor force.[47]

These apprehensions were buttressed by a recent analysis of the U.S. economy which included an international comparison of labor force participation rates for prime age people. The United States participation rate for this age group declined from 2008 to 2015 while it was growing in other countries. Further, the U.S. rate is substantially lower than the average rate of the 34 nations in the OECD, Japan and Great Britain (Figure 10). The OECD attributes the U.S. decline in labor force participation to the growing opioid crisis.[48]

Figure 10: Labor Force Participation Rates, 2006-2018



The opioid crisis should be viewed as a dual threat by employers throughout the state. Businesses must contend not only with the increasing difficulty of finding qualified workers caused by the crisis, but also the compromised state of those in their employment who struggle to cope with their addiction or require time off to deal with a family member or loved one with an opioid addiction.

HOW LARGE ARE THE ECONOMIC AND FISCAL IMPACTS?

The economic and fiscal impacts of the opioid epidemic on the state are enormous and its growth is rapid and relentless. Absent a curtailment of opioid misuse and overdose deaths, the state faces an unprecedented constraint to growth.

We present our macro-level estimates here and our detailed calculations and methodologies in the following sections.

	Estimated Impact in 2017
The Economy	
Lost Productivity from People Unable to Work	$5.9 Billion
Foregone Incomes due to Fatalities	$1.1 Billion
Businesses	
Lost Business Productivity due to Absenteeism	$1.9 Billion
Lost Business Productivity due to Presenteeism	$775 Million
Additional Health Care Costs	$2.1 Billion
Health Care Providers	
ED Visits	$122 Million
Inpatient Stays	$538 Million
ICU Stays	$271 Million
Neonatal Abstinence Syndrome	$48 Million
Early Intervention and Support for Families Affected by OUD	?
Medical Complications from OUD*	?
State Budget	
MassHealth	$860 Million
Dept. of Public Health	$136 Million
Dept. of Mental Health	$17 Million
Dept. of Children and Families	$370 Million
Criminal Justice System	$500 Million
Communities	
First Responders	$43 Million
Opioid-Related Police Costs	$510 Million

* Including HIV/AIDS, Hepatitis C, Hepatitis B, and Endocarditis

Impact On: Massachusetts Economy

While the extent of the drag of the opioid epidemic on the national economy is well documented[49], relatively little work has been published on the impact at the state level. MTF has endeavored to evaluate and quantify the impact on the Massachusetts economy at large in three critical categories: 1) the loss of productivity from those excluded from the labor force due to opioid use disorder, 2) the economic loss due to opioid overdose fatalities, and 3) business productivity loss from absenteeism and presenteeism. The first two categories are detailed in the section below. The third category is addressed in the "Impact On: Businesses" section beginning on page 23.

Lost Productivity – Out of the Workforce

To estimate the loss in workforce productivity from the opioid crisis in the state, we need answers to two questions:

- **How many people were prevented from working due to opioids?**
- **How much would these individuals have contributed to economic growth had they been employed?**

The answer to the first question is presented in Table 2, where:

Column A
MA Civilian Non-institutionalized Population Persons 16 years of age and older residing in Massachusetts who are not in penal and mental facilities or homes for the aged and who are not on active duty in the Armed Forces.[50]

Column B
Labor Force Participation Rate (LFPR) The existing workforce divided by the civilian non-institutionalized population expressed as a percentage (source – Moody's Analytics).

Column C
Estimated Workforce The size of the Massachusetts workforce (all employed and unemployed) if the LFPR remained constant at the 1999 rate of 68.5 percent (MTF calculation).

Column D
Existing Workforce Those who are employed added to those who are jobless, looking for a job, and available for work (source – Moody's Analytics).

Column E
Decline in Workforce The difference between the Estimated Workforce and the Existing Workforce showing how much the workforce decreased due to a declining participation rate *(MTF calculation)*.

Column F
The Massachusetts Unemployment Rate The average unemployment rate for the calendar year (source Moody's Analytics).

Column G
Loss from Unemployment Rate The decline in the workforce multiplied by the unemployment rate to estimate the number of individuals who might not find employment due to economic conditions *(MTF calculation)*.

Column H
20% Loss Due to Opioids Subtracting the loss from the unemployment rate (Column G) from the decline in the workforce (Column E) and multiplying by 0.20 using Krueger's estimate that 20 percent of the loss in the labor force is attributed to the opioid crisis yields the number of Massachusetts individuals kept from the workforce due to opioids *(MTF calculation)*.

As shown in Table 2, an estimated 32,700 people were kept from the workforce due to the effects of the opioid crisis in 2017. From 2011 to 2017, the state has consistently seen 30,000 or more people unable to work due to opioid misuse.

Table 2: Loss of MA Workers due to the Opioid Crisis, 1999 – 2017 (workforce data in thousands)

	A	B	C	D	E	F	G	H
	MA Civilian Non-Institutionalized	LFPR	Estimated Workforce	Existing Workforce	Decline in Workforce	MA Unem. Rate	Loss from Unem. Rate	20% Loss due to Opioids
1999	4,894,323	68.5%	3,354,301	3,354,301	0	3.2	0	**0**
2000	4,928,914	67.6%	3,378,008	3,330,585	47,423	2.7	1,280	**9,228**
2001	4,972,576	68.0%	3,407,931	3,380,749	27,182	3.7	1,006	**5,235**
2002	5,006,058	68.5%	3,430,878	3,431,044	-167	5.3	-9	**-32**
2003	5,028,599	68.1%	3,446,326	3,422,229	24,097	5.7	1,374	**4,545**
2004	5,043,878	67.3%	3,456,797	3,394,826	61,971	5.1	3,161	**11,762**
2005	5,063,709	66.8%	3,470,388	3,383,959	86,429	4.8	4,149	**16,456**
2006	5,092,913	67.0%	3,490,403	3,413,019	77,385	4.9	3,792	**14,719**
2007	5,134,478	66.7%	3,518,889	3,426,334	92,556	4.6	4,258	**17,660**
2008	5,184,519	66.6%	3,553,185	3,452,494	100,691	5.5	5,538	**19,031**
2009	5,237,316	66.3%	3,589,369	3,471,729	117,641	8.1	9,529	**21,622**
2010	5,251,504	66.3%	3,599,093	3,479,671	119,422	8.3	9,912	**21,902**
2011	5,293,864	65.5%	3,628,124	3,469,103	159,021	7.3	11,609	**29,482**
2012	5,348,778	65.2%	3,665,759	3,485,916	179,844	6.7	12,050	**33,559**
2013	5,404,877	65.0%	3,704,206	3,513,742	190,464	6.7	12,761	**35,541**
2014	5,458,228	65.3%	3,740,770	3,566,226	174,544	5.7	9,949	**32,919**
2015	5,503,237	65.2%	3,771,617	3,588,665	182,952	4.8	8,782	**34,834**
2016	5,542,991	65.2%	3,798,862	3,612,026	186,836	3.9	7,287	**35,910**
2017	5,584,209	65.5%	3,827,111	3,657,399	169,712	3.7	6,279	**32,687**

Having estimated the loss in potential employment due to the opioid crisis, the calculation of lost productivity becomes relatively straightforward. As shown in Table 3, MTF assumes an average of 50 weeks of work and multiplied it by the average hours of work per week (source: Federal Reserve of St. Louis Economic Research - ***FRED***) to get the average number of hours worked per year.

Multiplying the average number of hours of work per year by U.S. output per hour (source: ***FRED***) yields lost productivity for the year.[51]

Table 3: Lost Productivity from the Opioid Crisis, 1999 - 2017

	Emp. loss due to opioids	Avg hrs/week	Avg. hrs/yr at 50 Weeks	US output/hr in $	Lost productivity in $	Percent of State GSP
1999	0	34.2	1,710.0	77.96	0	
2000	9,228	34.1	1,705.0	80.28	1,263,120,982	0.44%
2001	5,235	34.0	1,700.0	82.44	733,672,542	0.25%
2002	-32	33.9	1,695.0	86.01	-4,597,599	0.00%
2003	4,545	33.8	1,690.0	89.18	684,979,778	0.22%
2004	11,762	33.7	1,685.0	91.96	1,822,565,572	0.55%
2005	16,456	33.6	1,680.0	93.87	2,595,042,590	0.75%
2006	14,719	33.5	1,675.0	94.69	2,334,388,822	0.65%
2007	17,660	33.4	1,670.0	96.18	2,836,627,163	0.75%
2008	19,031	33.6	1,682.1	96.96	3,103,860,114	0.81%
2009	21,622	33.5	1,677.1	100.02	3,626,999,418	0.94%
2010	21,902	33.6	1,682.1	103.29	3,805,235,181	0.95%
2011	29,482	33.1	1,654.6	103.43	5,045,254,043	1.21%
2012	33,559	33.0	1,650.8	104.34	5,780,588,944	1.33%
2013	35,541	33.2	1,660.8	104.66	6,178,001,299	1.40%
2014	32,919	33.3	1,665.0	105.68	5,792,390,221	1.26%
2015	34,834	33.5	1,672.5	107.00	6,233,823,989	1.27%
2016	35,910	33.4	1,671.7	107.00	6,423,237,951	1.27%
2017	32,687	33.5	1,672.5	108.40	5,926,270,598	1.12%
Total					**64,181,461,607**	

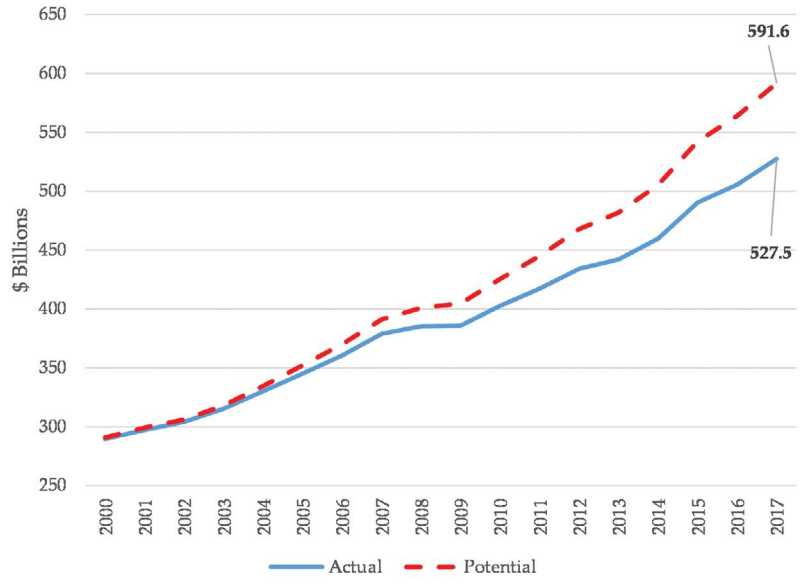
Results

In 2000, the state lost $1.26 billion in productivity due to people kept from the workforce from opioids, representing 0.44 percent of total gross state product (GSP). Since 2011, the state averaged $5.9 billion in lost productivity annually or 1.27 percent of state GSP, which is triple the loss in 2000.

More importantly, these losses are cumulative. As displayed in Figure 11, if not for the opioid-related losses in productivity, Massachusetts' GSP would have risen to over $590 billion in 2017, $64 billion or 12 percent higher than actual growth.

If not for the opioid-related losses in productivity, Massachusetts' GSP would have RISEN TO OVER $590 BILLION in 2017, $64 billion or 12 percent higher than actual growth.

Figure 11: Comparison GSP: Actual vs. Non-Opioid Potential, 2006-2017



Fatalities – Foregone Incomes

During the same time period, 2000 – 2017, Massachusetts lost 15,800 people to overdose deaths from opioids. It is not known how many of these individuals were in the workforce. But in a recent Massachusetts Department of Public Health publication, the administration used death certificates to analyze opioid-related deaths by industry and occupation.

During 2000 – 2017, Massachusetts lost 15,800 people to overdose deaths from opioids.

DPH found that of the 5,190 people who died of an opioid overdose between 2011 and 2015 (excluding out of state residents and those whose death certificates contained insufficient information on employment), 4,302 or 83 percent were employed.[52] The 83 percent finding is in line with the civilian labor force participation rate of people aged 25 – 54 which has ranged between 82 percent and 84 percent since 1999.[53]

Table 4: Foregone Income from Opioid-Related Deaths, 2000 - 2017

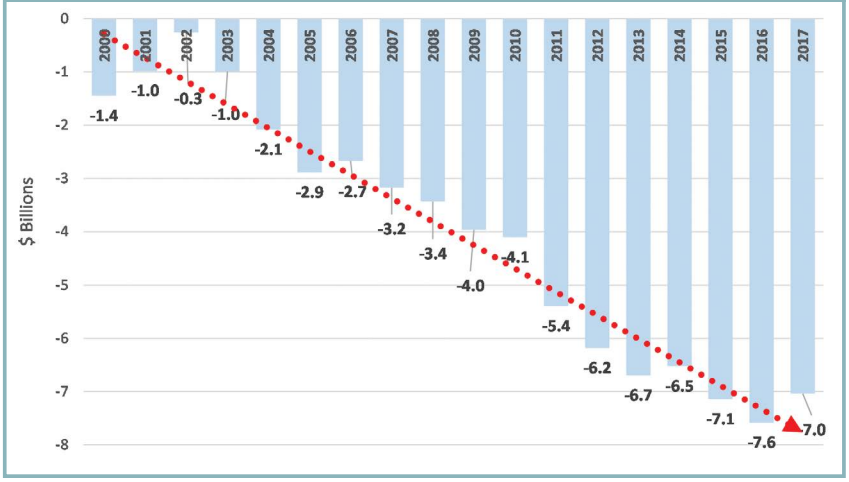
	MA Opioid-Related Deaths	Avg. Yearly Wages	Percent Working	Total Lost Income over 25 years	25 Year Foregone Income
2000	379	23,279	83%	-483,037	**-183,070,973**
2001	506	23,514	83%	-487,916	**-246,885,510**
2002	526	23,752	83%	-492,844	**-259,236,192**
2003	614	23,991	83%	-497,823	**-305,663,137**
2004	514	24,234	83%	-502,851	**-258,465,522**
2005	575	24,479	83%	-507,931	**-292,060,047**
2006	660	24,726	83%	-513,061	**-338,620,344**
2007	642	24,976	83%	-518,244	**-332,712,368**
2008	622	25,228	83%	-523,478	**-325,603,532**
2009	638	25,483	83%	-528,766	**-337,352,712**
2010	560	25,740	83%	-534,107	**-299,099,963**
2011	656	26,000	83%	-539,502	**-353,913,377**
2012	742	26,000	83%	-539,502	**-400,310,557**
2013	961	26,000	83%	-539,502	**-518,461,517**
2014	1,354	26,000	83%	-539,502	**-730,485,841**
2015	1,685	26,000	83%	-539,502	**-909,061,036**
2016	2,154	26,000	83%	-539,502	**-1,162,087,520**
2017	2,069	26,000	83%	-539,502	**-1,116,229,842**
Total					**-8,369,319,989**

We can apply the 83 percent working figure along with DPH results to estimate an average annual wage for those who died from opioid overdoses.[54] As the number of deaths spiked, forgone wages exceeded $1.1 billion for the past two years, double the loss in 2013 and triple wage losses in 2011 (Table 4).

Cumulatively, lost productivity and forgone wages have cost the state over $70 billion since 2000 (Tables 3 and 4), averaging $7 billion in slowed economic growth for the past five years (Figure 12). The impact is larger than many might expect and the trend (dotted red line) is alarming. Absent a curtailment of opioid misuse and overdose deaths, the state faces a growing constraint to growth.

Cumulatively, lost productivity and forgone wages have cost the state over $70 BILLION since 2000, averaging $7 BILLION in slowed economic growth for the past five years.

Figure 12: Summary – Impact on Massachusetts Economy from Lost Productivity and Foregone Income, 2000 - 2017



Impact On: Businesses

Lost Productivity due to Absenteeism and Presenteeism

Whether absence from work is due to managing one's substance use disorder or managing the care of a family member, or an opioid-related job turnover, or delays in finding a replacement, or time spent training the replacement – the reasons are many – companies experience a loss of performance when people miss work or work while dealing with illness, injury or anxiety.

The costs of absenteeism are greater and more complicated than a simple measure of wage replacement or foregone productivity. The consequences of missed work might include such things as keeping additional staff in reserve, paying overtime to fill needs, hiring temporary help, or lost revenue from production shortages. Several national studies have placed employer losses from health-related absenteeism and presenteeism in the range of $150 billion to $260 billion annually.[55]

For this report, MTF employs a straightforward calculation that does not include many of these related costs companies must address, relying instead on a recent analysis that estimated employees with a prescription opioid use disorder miss 29 work days a year, or 18.5 more days than the general workforce (Figure 13).

Figure 13: Workdays Missed from Prescription Opioid Use Disorder[56]

	General Work Force	Any SUD	Alcohol Use Disorder	Illicit Drug Use Disorder	Pain Med Use Disorder	Marijuana Use Disorder	In Recovery
Missed work days for injury, illness per year	8.4	10.2	9.4	13.0	22.2	10.6	8.3
Missed work for other reasons per year	2.1	4.7	4.7	5.4	6.8	4.8	1.2
Total missed work days past year	10.5	14.8	14.1	18.4	29.0	15.4	9.5
Worked for more than one employer in last year (%)	25	36	36	42	42	45	23

Using the same methodology as those who are kept out of the workforce due to an opioid disorder, MTF calculates that those who missed 29 days from opioids saw a decline from the 1,602 hours worked per year by those in the general workforce to 1,478 total hours, or 124 fewer hours worked per year. At an average output per hour of $108.40 (as outlined in Table 3), the 124 lost hours results in nearly $2 billion in lost productivity to Massachusetts companies (Table 5).

Research on the costs of presenteeism, defined as coming to work with an illness, injury, or anxiety that causes reduced job performance, have a wide range of estimates that are often equal to or higher than the costs of absenteeism. In this analysis, MTF estimates reduced productivity incurred from a loss of 1 hour per week from people working while managing the effects of opioid addiction. As shown in Table 5, one hour of lost performance per week across all 143,000 employees who misused pain relievers results in an estimated $775 million in lost productivity at Massachusetts employers.

Table 5 : Potential Loss of Business Productivity from Absenteeism and Presenteeism

	Employees	Hours Lost / Year	Output/Hr.	Total Productivity
Absenteeism	143,000	124	108	(1,922,224,161)
Presenteeism	143,000	50	108	(775,090,388)

As a comparison, these absenteeism and presenteeism estimates are within the range of a 2003 report on the impact on productivity for workers with depression. In that study, the authors found that those experiencing depression averaged 5.6 hours/week of lost productive time (LPT) in combined absenteeism and presenteeism, compared to 1.5 hours for those with no depression.[57] The difference, 4.1 hours/week of LPT, projects to approximately $3.2 billion in foregone productivity for Massachusetts businesses from the impacts of absenteeism and presenteeism.

Similar to excess health care costs, family members of individuals who misuse pain relievers also bear the burden of needing time off to confront the challenges of the disease that may include meeting with medical or behavioral experts or transporting an individual to treatment. These costs can be considerable and are not included in this report.

Excess Health Care Costs

Numerous studies have concluded that people who misuse pain relievers have higher health care costs than those without a use disorder. A review of nine studies on the additional health care costs for those privately insured shows a range between $10,000 and $20,000 per employee per year. The findings, listed in Table 6, yield an average of $14,712 more in health care costs per employee per year.[58]

Table 6: Excess Health Care Costs of Employees Who Misuse Pain Relievers

Studies	Excess Health Care Costs / Employee
Birnbaum et al, 2006	13,363
Council of Economic Advisors	15,474
FairHealth, 2016	15,898
Florence et al, 2016	16,257
Kirson et al, 2016	14,810
Rice et al, 2014a	10,627
Rice et al, 2014b	11,376
White et al, 2005	14,054
White et al, 2011	20,546
Average	**14,712**

According to figures released in the 2015-2016 ***National Survey on Drug Use and Health*** (NSDUH) from the Substance Abuse and Mental Health Services Administration (SAMHSA), 228,000 people in Massachusetts reported misusing pain relievers in the past year and two-thirds of those, or 143,000, were employed when they responded to the survey.[59] That's 4.2% of the total workforce in Massachusetts in 2016. This means a business with 1,000 employees is, on average, estimated to have 42 employees who misuse pain relievers.

At $14,712 in additional health care costs per person, the 143,000 employed individuals who misused pain relievers in 2015 cost businesses approximately $2.1 billion more than their fellow employees without a pain use disorder. (It is important to note that there may be some overlap between these annual costs to businesses and the costs to health care providers from managing and treating overdose episodes covered in the next section.)

But excess health care costs do not end with the individual. Several studies have estimated the excess health care costs of family members of people with opioid use disorder. One study concluded: "Family members of AOD patients (alcohol or drug diagnosis) had higher per member-month emergency room (ER), primary care, psychiatry/AOD, outpatient, and total costs (with and without psychiatric and AOD service cost) than control family members."[60] These costs have been estimated at approximately $400 more per family member per year than those without a family member suffering from a substance use disorder. These excess health care costs are not included in this report.

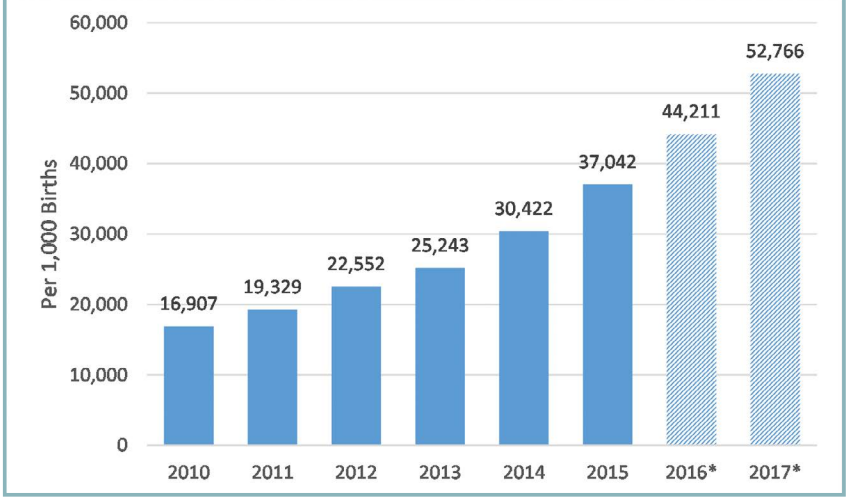
A business with 1,000 employees is, on average, estimated to have 42 employees who misuse pain relievers.

Caring for Opioid Overdose Episodes – Health Care Providers

Overdose victims arrive at an ED for treatment and evaluation. Depending on the severity of the overdose, the patient is either treated and released, admitted to the hospital for more care (inpatient), or, in acute cases, transferred to the intensive care unit (ICU).

Opioid-related hospital admission data is collected by the Healthcare Cost and Utilization Project (HCUP), a federal-state-industry partnership which offers the most comprehensive source of hospital care data. HCUP is the source for the number of opioid-related ED visits (Figure 14) and inpatient stays in Massachusetts.[61] Opioid-related ED visits increased at an alarming rate of 24 percent per year from 2010 to 2015, reaching 37,000.

Figure 14: Opioid-Related ED Visits, 2010-2017
(*2016 and 2017 are projections based on 2010-2015 growth rates)



Using national ED cost data[62] (inflated annually by medical care Consumer Price Index in urban cities), the cost of treating and releasing opioid-related overdose victims increased 250 percent since 2010 to an estimated $81 million in 2015 and a projected $122 million in 2017 (Table 7).

Table 7: Cost of Opioid-Related ED Visits, 2010 – 2017
(*2016 and 2017 are projections based on 2009 – 2015 growth rates)

	ED Visits	Avg. Cost	Total
2010	16,907	1,895	**32,031,086**
2011	19,329	1,952	**37,734,559**
2012	22,552	2,024	**45,644,861**
2013	25,243	2,074	**52,342,881**
2014	30,422	2,123	**64,589,970**
2015	37,042	2,179	**80,717,077**
2016	44,211	2,262	**99,990,341**
2017	52,766	2,319	**122,373,833**

HCUP provides the number of opioid-related inpatient stays for 44 states including Massachusetts, but does not break out the subset of individuals who require constant care in the ICU. However, a 2014 study of 90,707 non-fatal ED visits from prescription drug overdoses provides an estimate of those needing acute care, offering a proxy measure for Massachusetts. Using the 2010 Nationwide Emergency Department Sample, the authors found that 41 percent of opioid overdoses were treated and released, 55 percent were admitted to the hospital, and 4 percent were transferred to acute care.[63]

A subsequent 2017 study of adult admissions to 162 hospitals in 44 states found that opioid-related ICU admissions had increased by 34 percent from 44 per 10,000 ICU admissions in 2009 to 59 per 10,000 admissions in 2015.

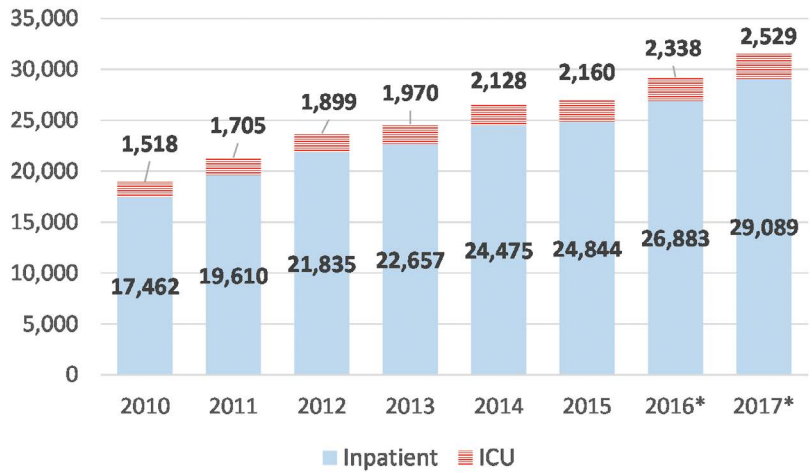
As shown in Figure 15, Massachusetts and Indiana were outliers in the number of ICU stays. The study concluded that "Massachusetts and Indiana were both substantially higher than the other states included in the analysis with the average opioid-related overdose critical care density twice that of other states".[64]

Figure 15: ICU Admissions for Opioid-Related Overdoses per 10,000 ICU Admissions

	2009	2010	2011	2012	2013	2014	2015
CA	29	35	42	42	33	39	41
IL	25	21	25	34	28	32	33
IN	92	72	83	91	110	114	109
MA	71	73	91	99	117	111	107
NY	38	36	44	42	48	49	60
OH	41	44	50	59	49	49	60
PA	27	31	33	37	41	48	52
TX	31	38	32	33	34	28	32

This finding suggests that 8 percent is a more reasonable estimate of inpatient opioid overdose victims who require intensive care in Massachusetts (Figure 16), which increased from approximately 1,500 in 2010 to 2,160 in 2015.

Figure 16: Opioid-Related Inpatient and ICU Stays, 2010 – 2017
(*2016 and 2017 are projections based on 2009 – 2015 growth rates)



Using national cost estimates for the average opioid-related inpatient stay[65] and recent research on ICU costs for opioid-associated overdoses that showed an increase in costs from $58,517 in 2009 to $92,408 in 2015[66] against Massachusetts data on the number of opioid-related inpatient stays, Tables 8 and 9 summarize health care costs for overdose victims who require inpatient treatment and ICU stays.

Inpatient costs increased 65 percent from $263 million in 2010 to $431 million in 2015 (Table 8), while ICU costs doubled from $95 million to an estimated $200 million in 2015 (Table 9). MTF further estimates 2017 inpatient costs at $538 million and ICU costs at $271 million.

Table 8: Cost of Inpatient Stays, 2010 – 2017
(*2016 and 2017 are projections based on 2009 – 2015 growth rates)

	Inpatient Stays	Avg. Cost	Inpatient Cost
2010	17,462	15,099	**263,657,771**
2011	19,610	15,558	**305,089,192**
2012	21,835	16,130	**352,201,837**
2013	22,657	16,525	**374,414,531**
2014	24,475	16,920	**414,125,835**
2015	24,844	17,366	**431,431,196**
2016	26,883	18,024	**484,541,637**
2017	29,089	18,482	**537,636,253**

Table 9: Cost of ICU Stays, 2010 – 2017
(*2016 and 2017 are projections based on 2009 – 2015 growth rates)

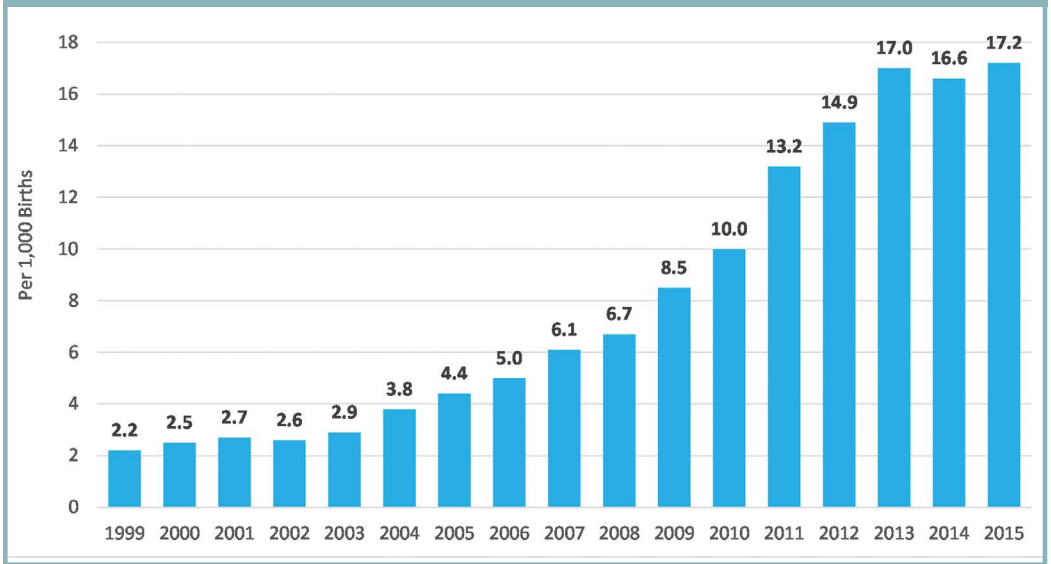
	ICU Stays	Avg. Cost	ICU Cost
2010	1,518	63,140	**95,874,440**
2011	1,705	68,128	**116,170,981**
2012	1,899	73,510	**139,575,713**
2013	1,970	79,317	**156,271,728**
2014	2,128	85,583	**182,144,841**
2015	2,160	92,408	**199,630,988**
2016	2,338	99,480	**232,546,688**
2017	2,529	107,093	**270,889,618**

Neonatal Abstinence Syndrome[67]

Neonatal abstinence syndrome (NAS) results from the sudden cessation of chronic fetal substance exposure, resulting in withdrawal symptoms at birth. NAS is an expected and treatable consequence of opioid exposure which can result in long hospital stays. The duration and severity of symptoms depend on several factors that include the combination of drugs involved and the duration of drug exposure. NAS incidents increased five-fold in the U.S. between 2000 and 2012 from a rate of 1.2 per 1,000 hospital births in 2000 to 5.8 per 1,000 births in 2012.

As shown in Figure 17, rates of NAS incidents in Massachusetts soared nearly eight-fold between 1999 and 2013, reaching 17.0 per 1,000 births. Further, Massachusetts rates of NAS were 2.5 times higher than the U.S. average in 2012.

Figure 17: Incidences of Neonatal Abstinence Syndrome per 1,000 Births in Massachusetts; 1999 - 2015



Newborns with NAS receive different treatments in different hospital settings that include nurseries, inpatient pediatric wards, and neonatal intensive care units (NICU), depending on the medical situation. Medically-treated NAS babies and those treated in the NICU averaged stays in excess of 20 days at higher costs while the costs for those managed in an in-hospital dedicated unit were far lower. Estimated NAS costs in Table 10 are from the Interagency Task Force on Newborns with Neonatal Abstinence Syndrome.[68]

Table 10: Cost of NAS Incidents, 2011 – 2017
(*2016 and 2017 are projections based on 2009 – 2015 growth rates)

	NAS Discharges	Avg. Cost	Total
2011	941	28,227	26,561,607
2012	1,040	29,100	30,264,000
2013	1,190	30,000	35,700,000
2014	1,162	31,500	36,603,000
2015	1,197	33,075	39,590,775
2016	1,257	34,729	43,662,153
2017	1,320	36,465	48,152,218

NAS incidents increased over 25 percent from 2011 to 2015 adding $13 million in health care costs.

The longer-term outcomes of infants with NAS are not well known[69]; nor are the costs needed to provide optimal prenatal, postpartum and early childhood support to families and young children affected by opioid use disorder. While some studies have reported that behavioral and developmental problems occur, many of these studies have suffered from methodological flaws which do not effectively control for baseline differences between groups, thus increasing the likelihood that observed associations are due to unmeasured confounding. The medical costs for providing support to families impacted by opioid use disorder and follow-up care are not included in this analysis.

Based on these estimates, health care costs of ED, inpatient, ICU and NAS from opioid use disorder reached $750 million in 2015, a 50 percent rise since 2011 (Table 11) with projections of nearly $1 billion in 2017.

Table 11: Health Care Provider Costs, 2011 – 2017
(*2016 and 2017 are projections based on 2009 – 2015 growth rates)

	ED	Inpatient	ICU	NAS	Total
2011	37,734,559	305,089,192	116,170,981	26,561,607	**485,556,339**
2012	45,644,861	352,201,837	139,575,713	30,264,000	**567,686,411**
2013	52,342,881	374,414,531	156,271,728	35,700,000	**618,729,140**
2014	64,589,970	414,125,835	182,144,841	36,603,000	**697,463,647**
2015	80,717,077	431,431,196	199,630,988	39,590,775	**751,370,035**
2016	99,990,341	484,541,637	232,546,688	43,662,153	**860,740,819**
2017	122,373,833	537,636,253	270,889,618	48,152,218	**979,051,921**

The $979 million estimate in 2017 does not include any estimates for increases in medical complications as a result of the opioid epidemic. Providers report higher incidents of hepatitis C and human immunodeficiency virus (HIV) from contaminated syringes, as well as a rise in heart infections (endocarditis) and cases of hepatitis B.

Impact On: Costs to the State

Massachusetts taxpayers bear the cost of the opioid epidemic through the many programs and policy areas required to address the crisis in the state. Direct costs include increased staffing to manage opioid-related programs, services for those addicted to opioids, and funding dedicated to opioid use treatments. Indirect costs, such as wages and benefits, are often the result of resources that had to be shifted away from other needs to manage opioid-related programs and services.

State spending on opioids is noteworthy for its size. The trajectory of opioid-related spending in Massachusetts is more alarming than the total amount and provides a grim testament to the impact of the epidemic over the last several years. For example, between 2012 and 2017, Massachusetts Department of Public Health (DPH) spending rose by 62 percent, while MassHealth spending on services and medications rose by more than 30 percent.

MassHealth – $860 million

MassHealth, the state's Medicaid program, provides health insurance to 1.8 million low-income residents and their families. The cost of the program is immense – $15.3 billion in 2017 – and in recent years the growth in MassHealth spending has led policymakers to change how services are delivered, more aggressively investigate inappropriate payments, and levy a $260 million assessment on employers to offset new spending. While many factors led to these MassHealth spending increases, the role of the opioid epidemic cannot be ignored.

Approximately 90,000 MassHealth members received services related to an opioid use disorder (OUD) in 2017 and 70,000 of them relied on MassHealth as their primary payer. Not surprisingly, as the opioid epidemic worsened, MassHealth opioid-related costs increased substantially.

Recent studies have shown that the medical cost for a Medicaid patient with opioid use disorder is substantially higher than for a Medicaid patient without opioid use disorder. Three studies analyzed this difference and estimated a range from $6,650 to $15,183 in excess health care costs, with an average of $12,317 per patient per year.

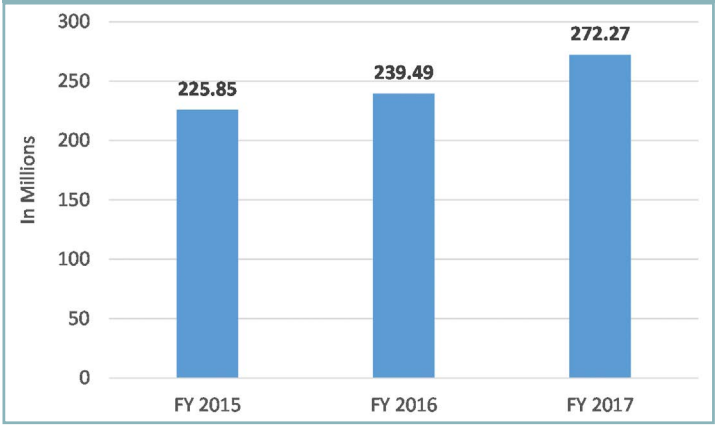
These findings are supported by the Center for Health Information and Analysis' 2016 report on the state's health care system which noted that the hospital readmission rate for Medicaid clients with co-occurring mental health and substance use disorders was 27 percent compared to 9 percent for clients without those conditions.[70] This means that, in addition to direct treatment costs, MassHealth members with substance use disorders are more likely to receive treatment for other medical conditions as well.

The $12,137 in per patient estimate suggests that MassHealth opioid-related costs for 70,000 MassHealth clients with OUD were approximately $860 million in 2017. Two of the studies note the inclusion of treatment costs without details.[71] Therefore, this analysis assumes that the $860 million estimate includes MassHealth costs for treatment programs.

According to administration officials, MassHealth spent approximately $270 million in 2017 on opioid treatments that span inpatient, 24-hour community-based, and outpatient services. Included in the MassHealth spend is the cost of medication assisted treatment (MAT), including methadone, buprenorphine and naltrexone. Based on the member's needs, services may include withdrawal management, stabilization, and other clinical and psychosocial supports. Many members with OUD are seen in medical settings as well as traditional behavioral health settings.

In a 2017 report released by the state's Inspector General, MassHealth treatment costs more than doubled between 2006 and 2016, from $93 million to $193 million.[72] Using a more complete picture of MassHealth spending, opioid use disorder costs grew by more than 20 percent between 2015 and 2017 from $226 million to $272 million (Figure 18).

Figure 18: MassHealth Opioid Use Disorder Costs, 2015 - 2017



The costs above reflect all behavioral health spending for members with OUD, as well as pharmacy costs for medication assisted treatment (MAT). MAT entails utilizing medications like methadone, naltrexone and buprenorphine to manage addiction, reduce the likelihood of overdose, and reduce the need for other expensive forms of care. MassHealth categorizes cost associated with naltrexone and buprenorphine MAT separately from other SUD service costs (including methadone) because these treatments are typically administered through pharmacy benefits and do not have to be dispensed in an opioid treatment program.

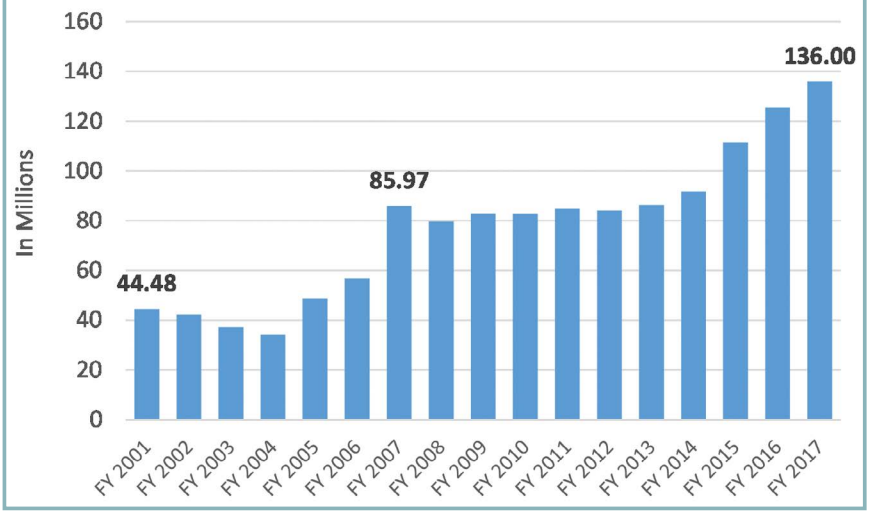
More than 25,000 MassHealth members receive non-methadone MAT each year. Since 2015, the cost of these treatments has grown from $72.4 million to $97 million, a 34 percent jump. While treatments are costly, they are effective in reducing the need for other more expensive services associated with overdoses and 24-hour care; MassHealth spending on MAT members is approximately 15 percent less than monthly spending on OUD clients receiving other forms of treatment.

In an effort to reduce costs associated with co-occurring mental health and substance use, the state's Medicaid waiver agreement with the federal government, signed in 2016, includes a $219 million commitment over 5 years to expand MassHealth coverage of residential rehabilitation services, introduce a new standardized assessment tool, and support recovery coaches and other support services.[73]

Public Health - $136 million

State spending on the opioid epidemic can most clearly be identified in the budget at the Department of Public Health (DPH). DPH supports treatment and prevention services for substance use and a range of other health issues facing the state; but over the last 15 years substance use in general and opioids specifically has been the primary area of focus at the department and budget makers. Bureau of Substance Addiction Services (BSAS) spending more than tripled (306 percent growth) between 2001 and 2017, while the total budget doubled to $136 million during that time (Figure 19).

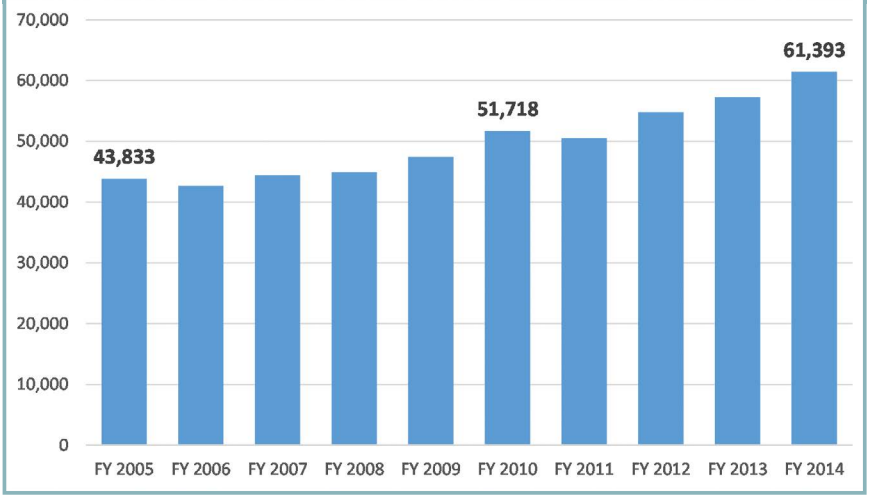
Figure 19: DPH Substance Use Spending in the Budget, 2001 - 2017



This increase in spending is directly correlated with an increase in the number of residents receiving opioid treatment services. Between 2011 and 2016, the number of people receiving office-based opioid treatment services through BSAS increased by 42 percent, while clinical stabilization services (24-hour clinically managed detoxification) increased by 23 percent.[74] More generally, heroin and other opioids have consistently comprised a larger and larger share of people referred to BSAS programs.

The number of heroin/opioid admissions to BSAS contracted programs increased by 17,560 (40 percent) over a ten-year period beginning in 2005 (Figure 20). At the start of that time, heroin/opioids were the primary substance of use for 43 percent of BSAS admissions; by 2014 they accounted for 59 percent of admissions.[75]

Figure 20: BSAS Admissions from Heroin/Other Opioids, 2005 - 2014



At the same time, BSAS clients reported using heroin in growing numbers. In 2005, 43,229 BSAS clients reported having used heroin in the past year. In 2014, 61,393 reported the same.

This influx of heroin and opioid-related admissions has forced BSAS to adjust the services offered and lawmakers to dedicate new sources of funding to combat the problem. The creation of dedicated substance use trust funds and the increased earmarking of budget money for specific substance use programs present two different funding approaches to combat the opioid epidemic. In 2015, lawmakers created a new Substance Abuse Trust Fund to provide BSAS with greater flexibility to access funds as necessary to respond to the ever-changing opioid epidemic. The fund was initially capitalized with $10 million and was supplemented by $5 million in both 2016 and 2017.

At the same time, BSAS has increasingly been asked to support specific substance use prevention and treatment programs around the state through budget earmarks. In 2013, the budget included three earmarks for specific substance use programs. In 2018, the number of substance use earmarks grew to 48.

BSAS spending growth has occurred in two waves. Significant spending increases between 2005 and 2007 accompanied the initial opioid epidemic associated with misuse of prescription opioids. State support then plateaued as the state economy suffered from the Great Recession and the epidemic evolved. As the second and third waves of the crisis occurred, BSAS has required significantly more resources. In fact, since 2013, more than 80 percent of all new DPH dollars included in the state budget have gone directly to substance use programs.

In addition to the use of state tax dollars to support the BSAS spending described above, DPH also receives millions of dollars in separate federal grants to combat opioid use. Those grants have increased significantly in number and total amount over the last five years. The number of SUD grants received by DPH has doubled since 2012, while the total amount of funds received has grown by 40 percent (Table 12). This spending, which is supported by federal tax dollars, is in addition to state spending on similar prevention and treatment efforts.

Table 12: Increase in Federal Grants, 2012 – 2017

	Number	Amount
FY 2012	8	43,762,479
FY 2017	16	61,330,478

Department of Mental Health - $17 million

The Department of Mental Health (DMH), like MassHealth, serves many clients who struggle with OUD. Research indicates that co-occurring mental health and substance use issues increase the complexity and cost of treatment, as is typically the case for those receiving services through DMH.

Statewide, DMH is authorized to provide inpatient or outpatient services to more than 25,000 residents. Services are provided either in a community setting or through four DMH operated facilities around the state. For outpatient clients, DMH provides recovery coaches and substance misuse counselors. Historical spending data in this area is inconsistent, but in 2019, DMH expects to spend $7.8 million on approximately 9,400 DMH clients in need of these services.

Since 2016, DMH has also been operating the Women's Recovery from Addiction Program (WRAP) at Taunton State Hospital. The program provides intensive treatment to women who have been civilly committed in place of incarceration. WRAP was created through legislation reforming the state's civil commitment procedures and has been expanded to 45 inpatient beds from an initial 15 bed pilot program. In 2019, DMH expects to spend $9.4 million to staff and operate WRAP – $7 million in spending growth since the start of the program. This brings the total cost of services for this department to $17.3 million.

Department of Children and Families – $370 million

More than 50,000 children in Massachusetts are in the state's child welfare system overseen by the Department of Children and Families (DCF), with 11,000 of those children in foster care placements. In recent years, there has been a surge in substantiated cases of child abuse and neglect referred to DCF. While there are a number of possible explanations for this increase, the opioid epidemic is clearly a contributing factor.

DCF sees the effect of opioid use disorder every day, although it is not easy to translate that effect into a dollar figure. In its 2018 progress report to the federal government, DCF referenced the opioid crisis repeatedly, concluding that "…within Massachusetts, the opioid crisis has continued to escalate contributing to growth in parental overdoses, and the birth of substance exposed newborns/neonatal abstinence syndrome, and abuse and neglect."[76] In the same report, DCF specifically cited the demands of the opioid crisis as a major factor in increased caseloads and the need for additional social workers.

DCF reports that they spent approximately $370 million in related costs in 2017 on cases where substance use disorder is at least one of the identified factors, demonstrating how difficult it is to quantify expenses solely related to the opioid crisis.

Yet another way to estimate the impact of increased opioid-related services is to measure the change in caseloads and spending between 2015 and 2017 on substance use matters. Beginning in 2015, DCF began to collect data on cases where substance use is one of the identified factors leading to DCF involvement. In 2015, DCF identified 7,303 cases where substance use factors contributed to the intake (not including substance exposed newborns or neonatal abstinence syndrome). In 2017, that number had grown to 23,492. It is possible that initial data counts were understated as new reporting systems came online, but the growth is striking and the budgetary impacts are significant.

During that period, DCF spending on cases involving substance use disorders increased by $65 million in direct costs from 2015 to 2017, representing a 21 percent jump in just two years. Spending growth includes $40 million to hire more social workers to work on substance misuse cases and $22 million for placement and support services for children with substance-exposed newborns (SEN) and neonatal abstinence syndrome (NAS).

Criminal Justice System - $500 million

Massachusetts spent approximately $1.17 billion in 2017 to support the state prisons and 14 county corrections systems and the 18,000 inmates housed there. In 2010, the National Center on Addiction and Substance Abuse at Columbia University estimated that more than 80 percent of inmates were "substance involved" and that 65 percent of inmates were diagnosed with drug use disorders.

An earlier study by the U.S. Department of Justice of prison populations found similar results –approximately 60 percent of state prisoners and sentenced jail inmates met the criteria for drug addiction or misuse versus 5 percent for the general population.[77] More recently, the Middlesex Sheriff's Office reports that "40% of all new intakes had a drug or alcohol addiction so severe they needed to be detoxed immediately – of these, 73% involved opioids."[78]

The $1.17 billion in spending for the Department of Corrections facilities and 14 county Sheriff's Offices is largely budgeted regardless of the opioid crisis. However, it is reasonable to conclude that between 35 percent and 45 percent of appropriated funds can be attributed to managing inmates with opioid addiction suggesting that the opioid crisis costs prisons and county corrections approximately $470 million annually in attributable expenses.

Class A narcotic arraignments (including heroin and morphine) have increased significantly over the last 10 years in Massachusetts (Table 13).

Table 13: Trial Court Arraignments, 2009 – 2016

	2009	2016	% Change
Overall	379,495	309,175	-18.5%
Class A	5,568	9,627	72.9%

Each year, the state spends $16 million in direct costs for SUD diversion, treatment and prevention programs within the state's criminal justice system. As highlighted in this report, this sizable amount hardly begins to capture the true fiscal impact of opioids and other illicit substances on the state budget. The largest direct expenditure on SUD within the criminal justice system is for the Massachusetts Alcohol and Substance Abuse Center (MASAC), operating by the Department of Corrections. MASAC provides 251 inpatient beds to treat people civilly committed for alcohol and drug use for up to 90 days of treatment. In 2017, MASAC was relocated from Bridgewater to Plymouth, which increased the number of inpatient beds from 238 to 251. In 2017, the state appropriated $13.3 million to operate MASAC.

As the opioid epidemic has worsened, the Trial Court has made new investments to increase the number of drug courts designed to provide treatment and supervision alternatives to incarceration. Beginning in 2015, the state budget has provided $3 million each year to expand access to drug courts around the state, and 30 of the specialty courts are now offered (up from 23 in 2009).

District Attorneys and the state Attorney General have also responded to the opioid program with new programs to prevent misuse and divert offenders into effective treatment. In 2016 and 2017, the state budget included $500,000 in funding for a new pilot program to divert non-violent drug offenders into treatment programs. The Attorney General received $1 million in new funding in 2017 to combat opioid addiction, with a specific focus on fraudulent prescriptions.

With an increase in opioid arraignments and a majority of inmates with SUDs, the Trial Court, Office of Probation, District Attorneys, Department of Correction and Sheriff's Department must all manage the costs of opioid use every day.

Impact On: Costs to Municipalities

Responding to Opioid Overdose Episodes

Municipal first responders and local hospitals across the Commonwealth comprise the front lines in the opioid epidemic, providing life-saving rescues daily. When an overdose is reported, local police, fire, EMTs and paramedics respond to the incident. If the individual is found unconscious, naloxone is administered. If the individual is incapacitated from a controlled substance other than alcohol, the individual is transported to an acute care facility which treats the patient and offers a substance use disorder evaluation before discharge.[79]

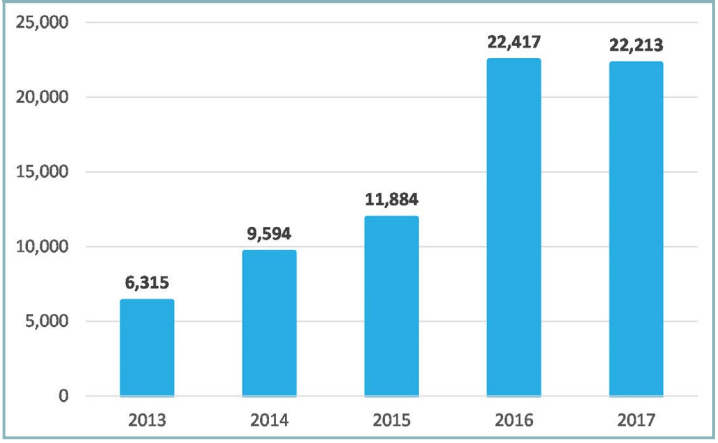
While a 911 call triggers the response to an overdose incident, 911 call data cannot always capture and report the nature of the emergency. The most accurate measure of the number of opioid-related first responder rescues and naloxone administrations derive from data supplied by licensed ambulance providers through the Massachusetts Ambulance Trip Reporting Information System (***MATRIS***) to the state's Office of Emergency Medical Services.

For an emergency transport to be categorized as opioid-related, there must be certain data entered into the MATRIS system, including whether the trip was listed as a poisoning, whether naloxone was administered, or whether the patient admitted to the use of drugs.

It is more likely that opioid overdoses are undercounted amid reports of "self-dosing" due to wider distribution of naloxone in communities and a heightened wariness of calling 911. Despite these issues, MATRIS data present the best measure of the number of opioid overdose incidents and naloxone administrations.

According to DPH reports, opioid-related EMS transports more than tripled between 2013 and 2016, exceeding 22,000 (approximately 60 responses per day) in 2016 and again in 2017 (Figure 21). The jump in 2016 could be caused by two issues: 1) changes in data collection requirements in 2015[80], and 2) a 2016 requirement that overdose victims be transported to a health care facility for evaluation.[81]

Figure 21: Massachusetts Opioid-Related EMS Transports



In estimating municipal costs, several caveats are necessary. The labor costs for police, fire and paramedics are largely fixed, meaning that these costs (with the exception of excess overtime) are expenses incurred regardless of the opioid crisis. However, as the crisis deepens, many municipalities are forced to divert staff to manage thousands of new 911 calls related to opioids, respond to overdose episodes, institute wrap-around services to help those with opioid misuse issues, and deal with increased property crimes – when they would otherwise be available for other duties.

MTF relied on anecdotal data from several municipalities to estimate the average cost of first responders attributable to an overdose to be $600 per episode. This is based on reports that the average event involves as many as eight personnel for a period of 60 to 90 minutes at an all-in rate of $50/hour. The precise costs are extremely variable and the $600 figure is a best guesstimate for purposes of this study. Again, the trends are more alarming than the cost for any specific year.

Transport costs of approximately $1,300 per event were estimated from the Health Policy Commission's report of the average in-network and out-of-network costs for an ambulance with advanced life support.[82] Suburban and rural transport costs are likely higher due to longer commutes to the nearest health care facility.

Naloxone purchased at pharmacies can run between $75 and $125 and costs to communities ranged from $30 to $70 per dose in 2017. The state used funds to bulk purchase naloxone, bringing the costs down to an average of $30 per dose used in this analysis.

Based on these numbers, MTF estimates total municipal costs for responding to opioid overdoses to be $43 million in 2016 and 2017, up $30 million or 250 percent since 2013. As noted earlier, these cost estimates are dependent on the number of reported opioid-related EMS incidents which are likely understated (Table 14).

Table 14: Estimated Municipal Response Costs of Opioid Overdoses, 2013 - 2017

	Overdose Episodes	Police, Fire, Paramedics ($600)	Transport ($1,300)	Narcan ($30)	Total
2013	6,315	3,789,000	8,209,500	189,450	**12,187,950**
2014	9,594	5,756,400	12,472,200	287,820	**18,516,420**
2015	11,884	7,130,400	15,449,200	356,520	**22,936,120**
2016	22,417	13,450,200	29,142,100	672,510	**43,264,810**
2017	22,213	13,327,800	28,876,900	666,390	**42,871,090**

These costs are relatively small when compared to the costs of programs to help overdose survivors recover and early intervention supports for families and children affected by SUD.

Community-Based Programs

In 2017, a team of researchers sent a survey to all 351 cities and towns in Massachusetts and received 110 responses. The purpose of the study was to identify which communities had developed programs for survivors following an overdose episode. The study reported that 23 communities "had implemented a collaborative, community-based, post-overdose program with a well-defined process to connect overdose survivors and their personal networks with support services or addiction treatment services."[83]

The researchers categorized the programs into four distinct categories: 1) multi-disciplinary team visits, 2) police visit with referrals, 3) outreach from a clinician, and 4) outreach to a community-based facility for information or services (Figure 22).

Figure 22: Post Overdose Outreach Categories

	Multi-Disciplinary Team Visit (n=8)	Police Visits with Referrals (n=4)	Clinician Outreach (n=6)	Location-Based Outreach (n=2)
Type of Outreach	Post-OD visit to residence of OD survivor or site of the OD event	Post-OD visit to residence of OD survivor or site of the OD event	Post-OD telephone-based outreach to OD event	Media and word-of-mouth outreach to whole community (including OD survivors)
Role of Public Safety Personnel	Attend visit. Assist public health representative, as needed.	Attend visit. Provide information and resources. Make referral to public health representative.	Identify and provide cases to clinician based on call logs and personal knowledge.	Assist in staffing community center and making linkages or referrals to public health representatives.
Role of Public Health Personnel	Attend visit. Provide information and referrals to OD survivor, family, and associates.	Contact individuals referred by police to help link them with appropriate services.	Contact individuals referred by public safety to help link them with appropriate services.	Assist in staffing community center and/or connecting with individuals referred by police to help link them with appropriate services.

Funding for public safety components was usually part of normal shift hours covered by municipal budgets, whereas the public health services were funded from a combination of existing budgets and outside grants. All programs that involved a clinician working with the police department reported that they had received outside grants to cover the costs.[84]

Estimating Police Time and Costs

In a 2015 report on the impact of the opioid crisis on Cape Cod, the authors estimated that approximately 30 percent, or $17.5 million, of the total $56.6 million budget for 15 police agencies in Barnstable County could be attributed to their work on heroin and opioid-related issues based on time spent by officers and staff and the volume of calls.[85]

This analysis was collected in 2013, which suggests that an updated estimate would likely push the 30 percent figure higher in 2018, given the intensification of the opioid crisis due to the prevalence of fentanyl. Given that Barnstable County accounted for 3.6 percent of opioid-related deaths from 2000 – 2017 and eight other counties reached over 92 percent, it is reasonable to extrapolate the 30 percent estimate across the majority of municipal police budgets. In 2017, the police budget total for 351 communities was $1.7 billion, meaning that the statewide costs to police departments attributable to opioids would reach $510 million.

CONCLUSION

The consequences of the opioid crisis are everywhere. Our fellow residents, families and communities are suffering from the crisis of addiction. For those afflicted and for those who love them, this epidemic is a relentless mix of fear, anxiety, hope and chaos. This crisis leaves too many people harmed, homeless and hopeless.

MTF hopes this report catalyzes greater urgency and engagement from all segments of our society in the battle against the scourge of this epidemic – particularly among Massachusetts employers – by exploring and explaining the economic and fiscal impacts of the opioid epidemic on the state. We have no illusions that this crisis is fundamentally about economics. While the opioid epidemic is causing considerable costs across all major systems in our state, the primary costs of this crisis are its impact on human lives – and these are incalculable. In this context especially, it is daunting to see the explosive growth of opioid addiction and misuse in Massachusetts since 2013.

Nevertheless, the numbers outlined in this report are startling from a pure economic perspective: we estimate lost productivity from this epidemic at $9.7 billion and costs attributable to opioid programs and services across systems (health care providers, the state and municipalities) to be at least $5.5 billion in 2017. And these numbers are likely understated because we are unable to estimate costs attributable to opioids in several areas noted in this report. The true costs are, therefore, potentially much, much larger. If we are unable to control the supply of opioids – particularly synthetic opioids like fentanyl and its analogs – the crisis will continue and the impact could be quite sizable.

We can do better. We must do better. For the future of our Commonwealth and the sake our children, we must ALL fully engage in the struggle to curtail this crisis. It is a fight for their lives – and the fight of our lives.

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