



Perspectives on the U.S. Opioid Crisis

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Centers for Disease Control and Prevention
Washington, D.C.**

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Research Triangle Park, North Carolina**

Overview

- Toxicology
- Opioid History
- How Did This Crisis Happen?
- Interventions
- What's Work Got to Do with It?
 - Fentanyl and First Responders

Papaver somniferum

- Opium is processed from the latex sap of the opium poppy, *Papaver somniferum*.



Opiate vs Opioid

- **Opiates**

- Chemical compounds that are “*extracted*” or “*refined*” from natural plant matter (poppy sap and fibers).
 - Opium, morphine, codeine, heroin

- **Opioids**

- Chemical compounds that generally are not derived from natural plant matter.
- Most opioids are “made in the lab” or “*synthesized*.”
 - Hydrocodone (Vicodin)
 - Oxycodone (OxyContin)
- When people wish to refer to all of drugs derived from opium poppy, they often use the term “***opioid***.”

3 Categories of Opioids

- **Natural opioids**

- Including morphine and codeine

- **Semi-synthetic opioids**

- Including hydrocodone and oxycodone

- **Synthetic opioids**

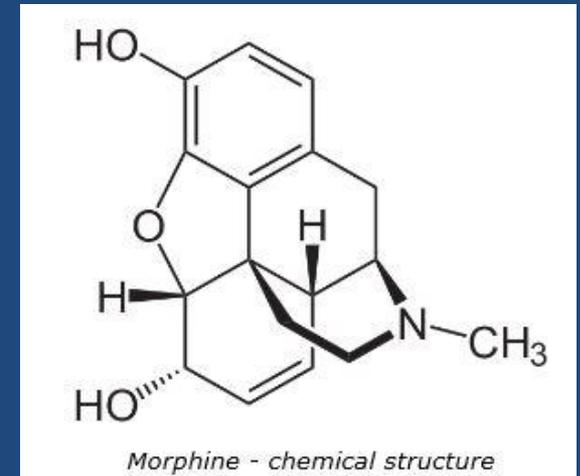
- Methadone, demerol, tramadol

- Fentanyl

- Used to treat severe cancer pain or to manage pain after surgery
- 50x to 100x more potent than morphine

- Carfentanil

- Used in veterinary medicine for sedating elephants
- 10,000x more potent than morphine



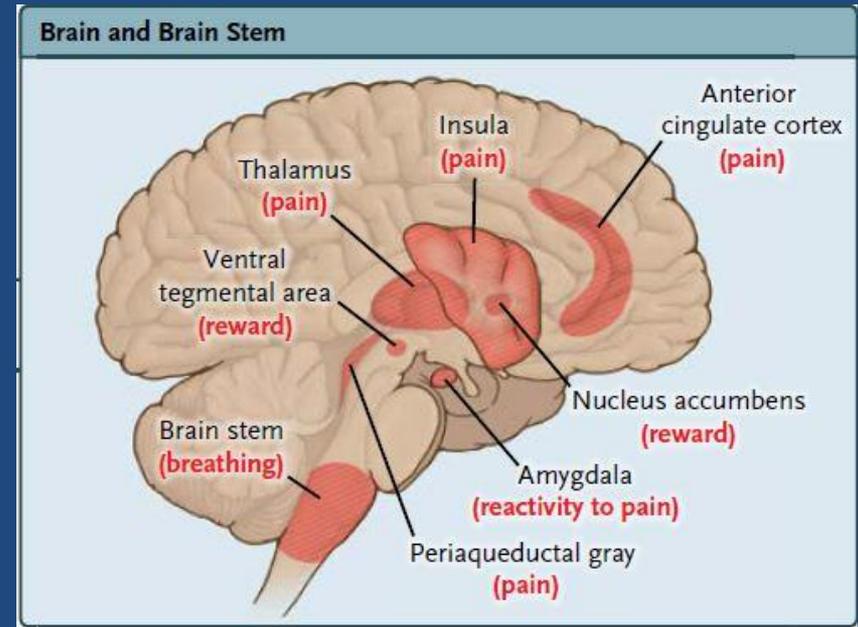
Pathophysiology

- Opioids increase activity at mu (μ), kappa (κ), and delta (δ) opioid receptors.
- Opioid receptors are activated by both *endogenous* (endorphins) and *exogenous* (opioids) compounds.
- Mu receptors are responsible for most of the clinical effects:
 - Regulate the perception of pain (analgesia) & pleasure (euphoria)
- Rewarding effects of opioids are accentuated mostly when the drugs are delivered *rapidly* to the brain—insufflation (snorting); intravenous (mainlining).

Location of Mu-Opioid Receptors

- **Brain and Brain Stem**

- High concentration in the thalamus, periaqueductal gray, insula, and anterior cingulate (regions involved with **pain perception**), in the ventral tegmental area and nucleus accumbens (regions involved with **reward**), in the amygdala (a region involved with emotional **reactivity to pain**), and in the brain stem (nuclei that regulate **breathing**).



- **Spinal Cord**

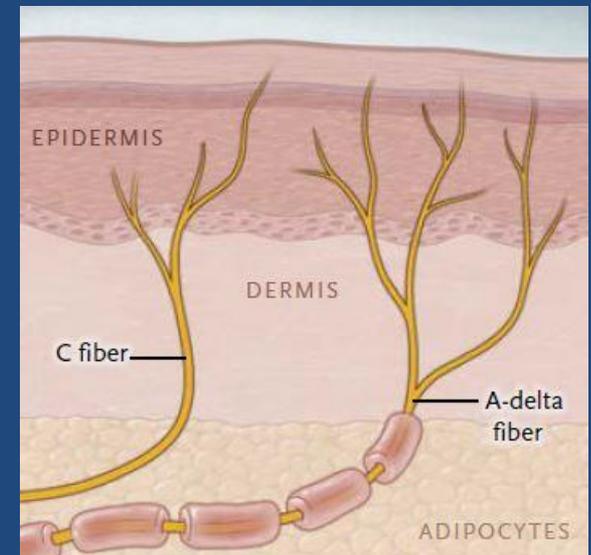
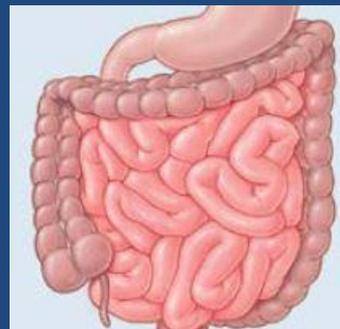
- High concentration of mu-opioid receptors is located in the dorsal horn.

- **Peripheral Nervous System**

- Modulate the perception of pain.

- **Small Intestine**

- Regulate gut motility.



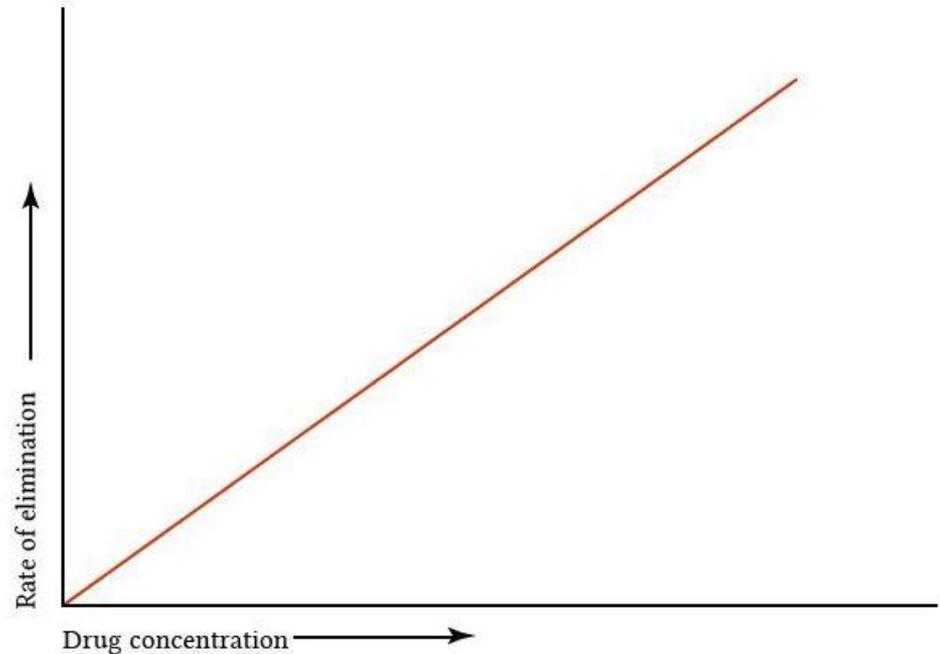
Toxicokinetics 1

- Expected pharmacokinetics from appropriate dosing is **not** applicable in misuse situations leading to overdoses
 - Tablet “bezoars” have erratic rates of absorption; delayed gastric emptying and decreased gut motility can **decrease** drug absorption
 - Drug misuse behaviors **increase** rate of absorption—insufflating or injecting tablets, heating fentanyl patches.

Toxicokinetics 2

Opioids, like other meds, undergo first order elimination—constant fraction is converted to metabolites by enzymatic processes per unit of time—the higher the concentration the faster the clearance.

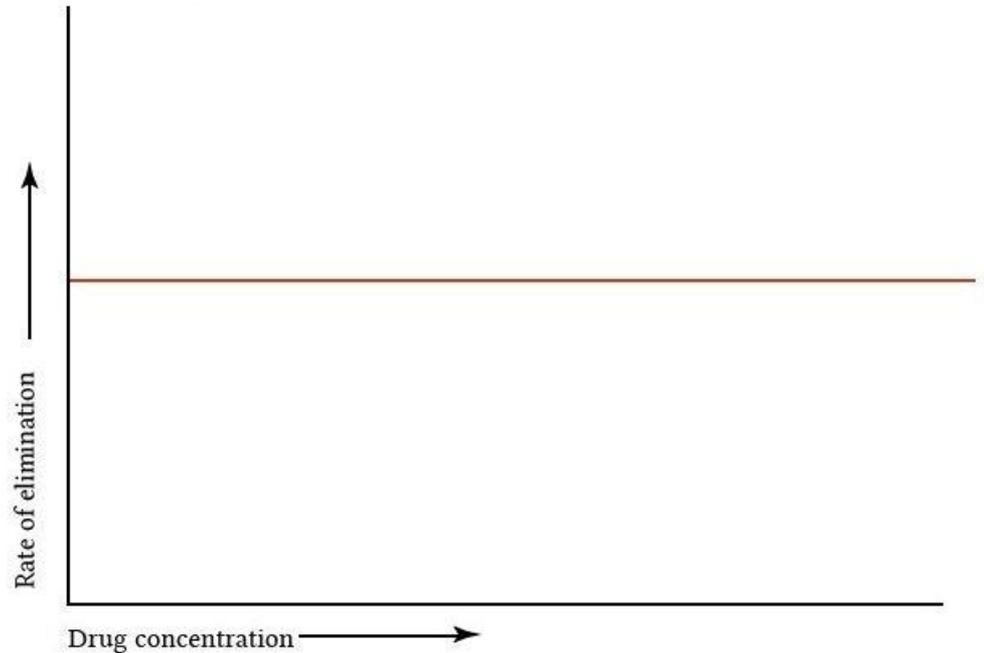
First order elimination kinetics:
relationship of concentration and elimination rate



Toxicokinetics 3

- High concentrations overwhelm enzyme systems resulting in **saturation**—converting 1st order to zero order elimination—rate of elimination is independent of the concentration.
- These toxicokinetic effects can produce opioid toxicity that may be severe, delayed in onset, and protracted as compared with expected therapeutic actions.

Zero order elimination kinetics:
relationship of concentration and elimination rate



Clinical Manifestations of Overdose

- Essential sign is **respiratory depression**
- Individual with a respiratory rate of 12 breaths/minute or less:
 - Who is not in physiologic sleep
 - Suggests acute opioid intoxication particularly when accompanied by **miosis** or **stupor**

» Boyer EW, Management of Opioid Analgesic Overdose, *New Engl J Med* 2012;367:146-155.

Clinical Manifestations of Being “Dopesick”

- Symptoms
 - Runny nose/tearing eyes
 - Chills and sweats
 - Muscle aches/spasms
 - Headache
 - Nausea/vomiting
 - Diarrhea
 - Anxiety/Agitation
- Motivator
 - Is avoidance of becoming “dopesick” a greater behavioral motivator than is euphoria seeking?

Drugs through American History

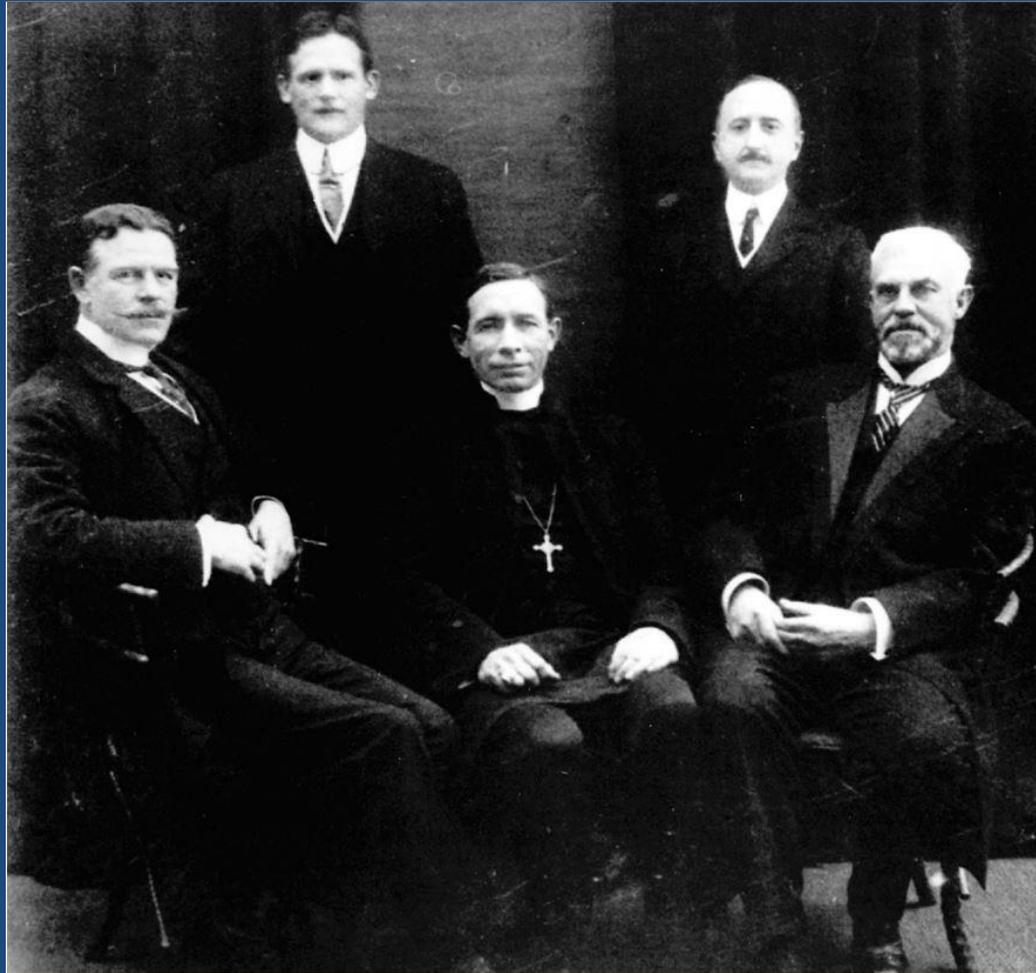
Post-Civil War through 1900s

- In decades after Civil War, U.S. developed a narcotics habit when disabled veterans became addicted to morphine.
- Genteel “society ladies” dosed up with *Laudanum* — a tincture of alcohol and opium.
- This “wonder drug” was widely used as a cough suppressant and sold as “elixirs” and “syrups.”
- And proved very effective at treating diarrhea in children—until infant deaths occurred.



“The Greatest Drug Fiends in the World”

Miroff, N. *Washington Post* (2017) quoting *Hamilton Wright* in 1908



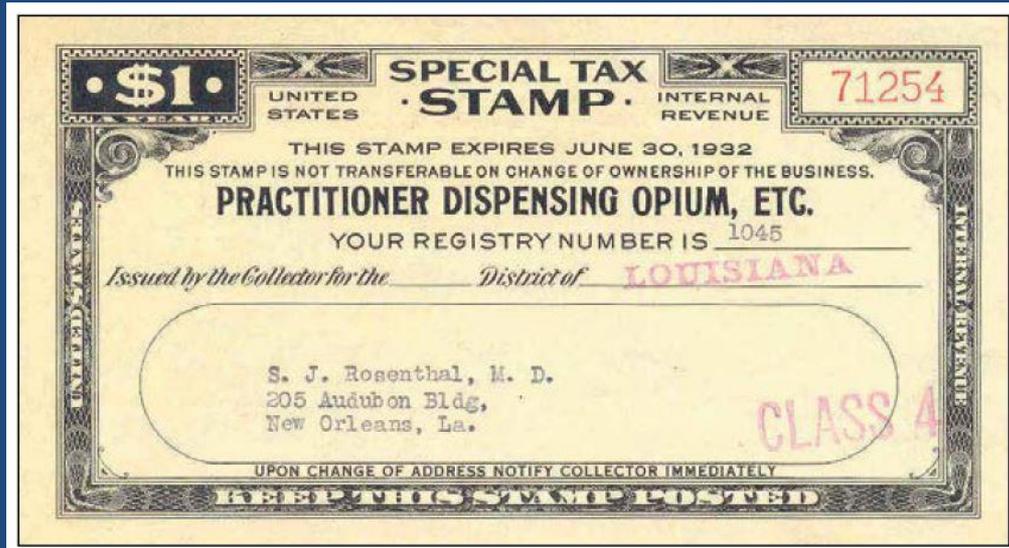
U.S. delegation to the *International Opium Conference* at The Hague in 1911.
America's first Opium Commissioner Hamilton Wright is at left.

Government Reacts to Opium Crisis

- **1890**
 - U.S. government began taxing opium.
- **1906**
 - *Pure Food and Drug Act* forced manufacturers to disclose the contents of their products, so consumers wary of opium would know if it was in their children's cough syrup.
- **1909**
 - Congress passed the *Opium Exclusion Act*, banning its import for the purpose of *smoking* opium.

1914—Harrison Act Tax

- Required anyone who imported, produced, sold, or dispensed “narcotics” (at that time meaning coca- as well as opium-based drugs) to register, pay a nominal tax, and keep detailed records. With such records, officials could better enforce existing laws, such as those requiring sale by prescription only.

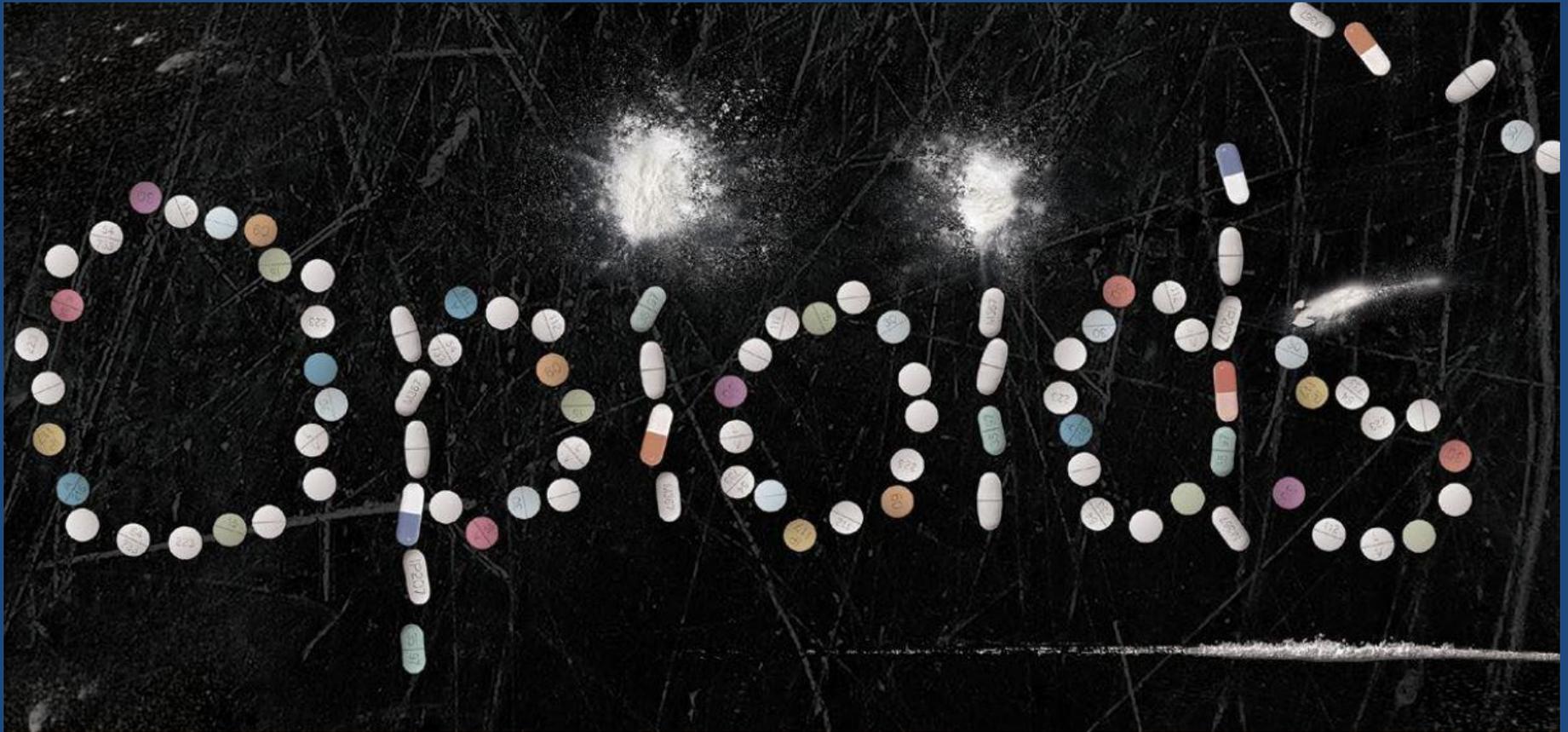


Controlled Substances Act of 1970

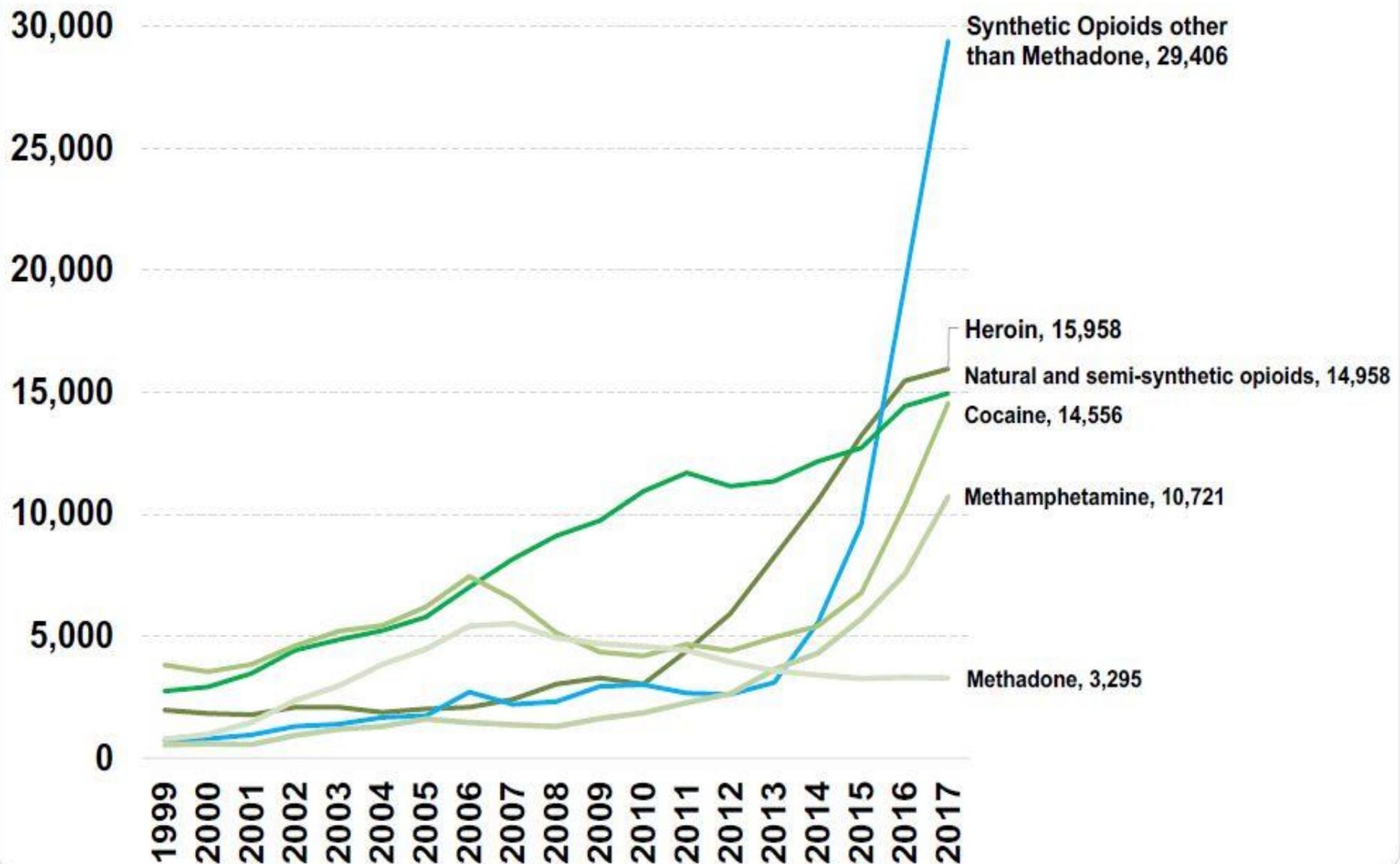
- Federal statute prescribing U.S. drug policy under which the manufacture, importation, possession, use and distribution of certain substances is regulated.
 - Replaced Harrison Act
- Passed by Congress as Title II of the *Comprehensive Drug Abuse Prevention and Control Act of 1970* and signed into law by President Nixon.
- CSA created 5 Schedules in a hierarchy of production, prescribing and dispensing controls.
 - Tetrahydrocannabinol (THC, marijuana) is still considered a **Schedule 1** drug by the DEA, even though some U.S. states have legalized marijuana for medical or recreational use. DEA considers Schedule 1 drugs to have no valid medical applications.

DEA Schedule	Abuse Potential	Examples of Drugs Covered	Some of the Effects	Medical Use
I	Highest	heroin, LSD, hashish, marijuana methaqualone, designer drugs	Unpredictable effects, severe psychological or physical dependence, or death	No accepted use; some are legal for limited research use only
II	High	morphine, PCP, codeine, cocaine methadone, Demerol benzedrine, dexedrine	May lead to severe psychological or physical dependence	Accepted use with restrictions
III	Medium	codeine with aspirin or Tylenol, some amphetamines, anabolic steroids	May lead to moderate or low physical dependence or high psychological dependence	Accepted use
IV	Low	Darvon, Talwin phenobarbital, Equanil, Miltown, Librium diazepam	May lead to limited physical or psychological dependence	Accepted use
V	Lowest	Over-the-counter or prescription compounds with codeine, Lomotil Robitussin A-C	May lead to limited physical or psychological dependence	Accepted use

21st Century

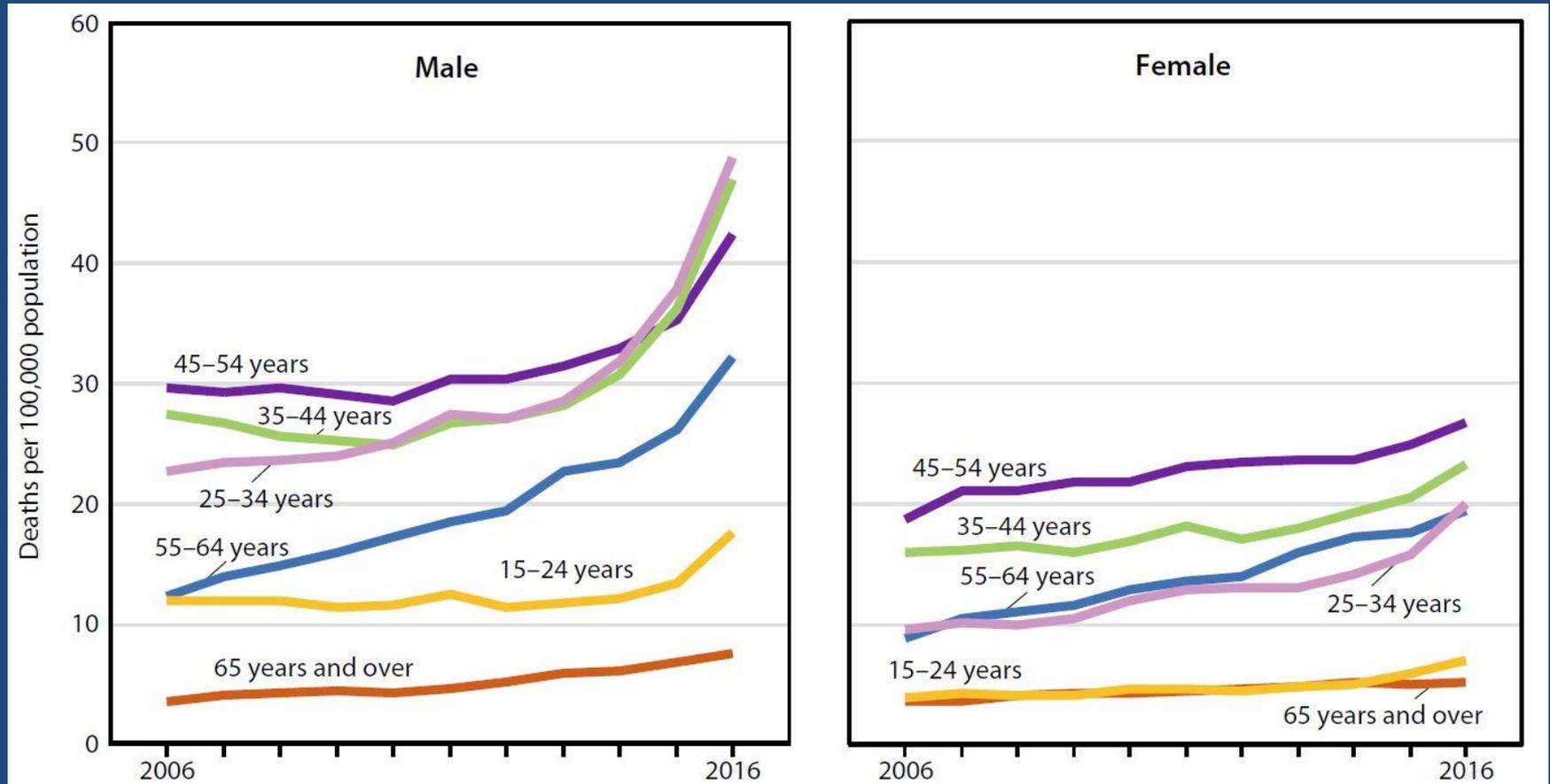


Drugs Involved in U.S. Overdose Deaths, 1999 to 2017



Drug Overdose Death Rates:

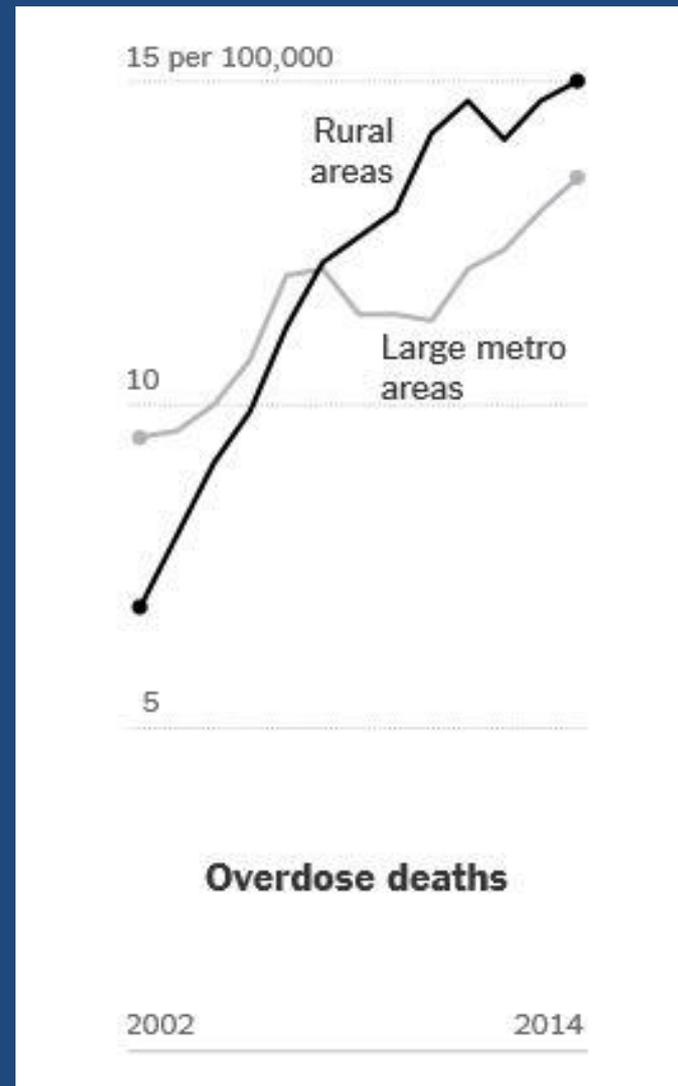
Aged 15 years or older by sex and age: United States, 2006–2016



Drug Overdose Deaths— Rural vs. Urban

- Death rates from overdoses in rural areas now outpace the rate in large metropolitan areas, which historically had higher rates in mid-20th century.

- Sources: “Drug Poisoning Mortality: United States, 2002–2014” by Lauren M. Rossen, Brigham Bastian, Margaret Warner, Diba Khan and Yinong Chong, National Center for Health Statistics, Centers for Disease Control and Prevention

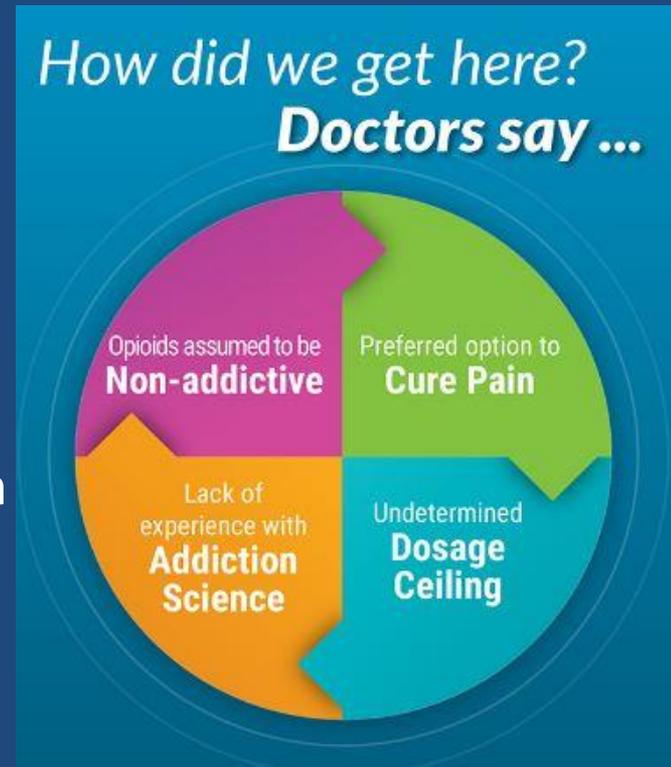


Causes

- *Profligate prescribing*
- *Predatory promotion*
- Psychologic pathology
- Incarceration without treatment
- Economic dislocation
- Genetics
- Others?

Medical Prescribing

- In 1996, the American Pain Society said MDs were **undertreating pain** and proposed that pain is the 5th vital sign.
- Physicians encouraged to screen patients for pain and to treat non-cancer pain to a degree not done before.
- Drug companies began to educate physicians and the public that opioids were a fast solution to pain without addictive risk. **This was false.**
- Prescription opioid use increased as insurers reimbursed physicians for opioid prescribing, creating a financial incentive.
- All this made opioids the “go-to” drug for all types of pain management.



Interventions

- Appropriate Prescribing
- Public Health Measures
- Overdose-Reversal
- Treatments for Opioid Addiction
- New Therapies for Pain
- Interdiction

Opioid Prescribing

https://www.cdc.gov/drugoverdose/pdf/calculating_total_daily_dose-a.pdf

Higher Dosage, Higher Risk.

Higher dosages of opioids are associated with higher risk of overdose and death—even relatively low dosages (20-50 morphine milligram equivalents (MME) per day) increase risk. Higher dosages haven't been shown to reduce pain over the long term. One randomized trial found no difference in pain or function between a more liberal opioid dose escalation strategy (with average final dosage 52 MME) and maintenance of current dosage (average final dosage 40 MME).

Dosages at or above 50 MME/day increase risks for overdose by at least

2x

the risk at
<20
MME/day.

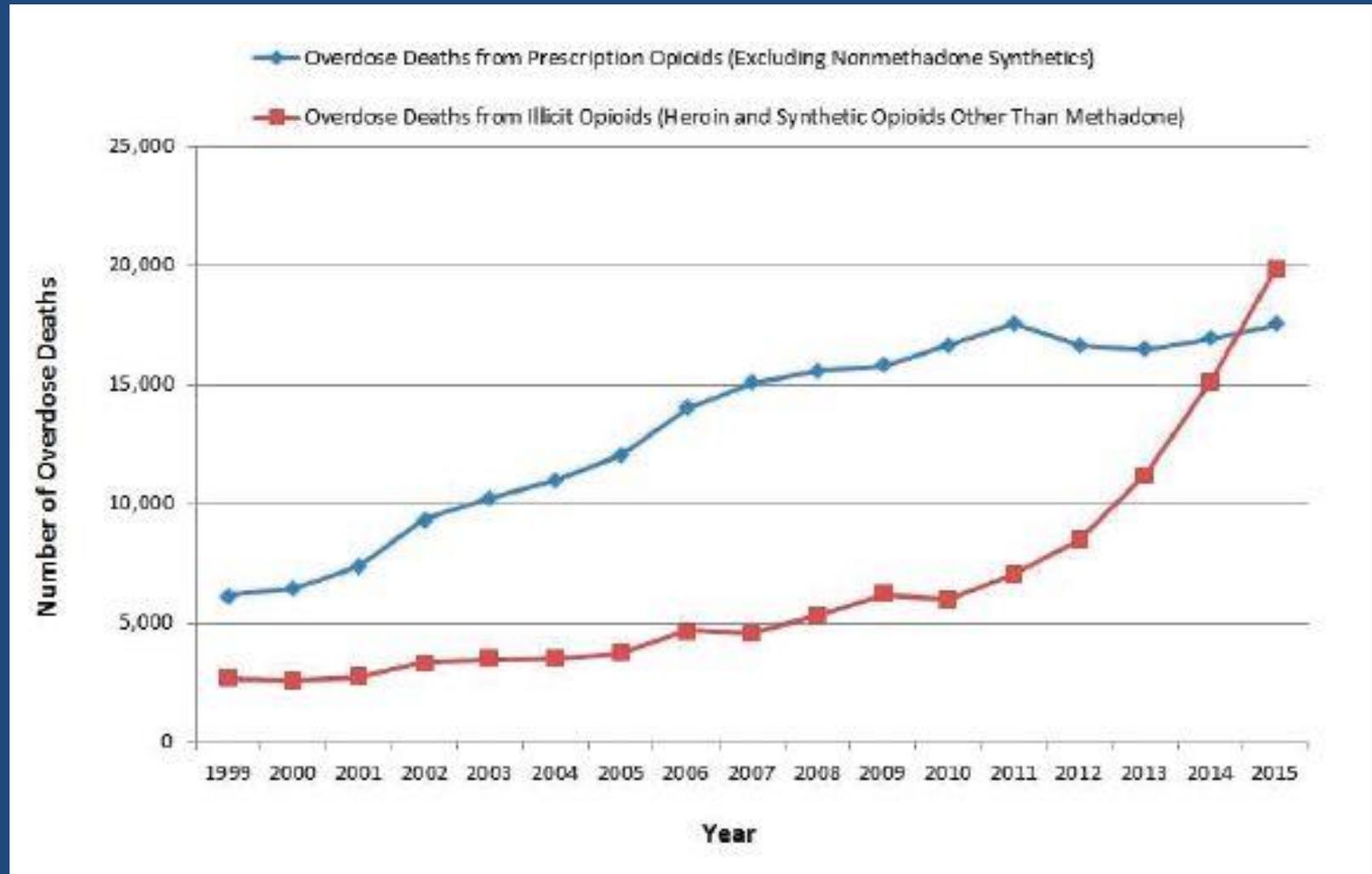
WHY IS IT IMPORTANT TO CALCULATE THE TOTAL DAILY DOSAGE OF OPIOIDS?

Patients prescribed higher opioid dosages are at higher risk of overdose death.

In a national sample of Veterans Health Administration (VHA) patients with chronic pain receiving opioids from 2004–2009, **patients who died** of opioid overdose were prescribed an average of **98 MME/day**, while **other patients** were prescribed an average of **48 MME/day**.

Calculating the total daily dose of opioids helps identify patients who may benefit from closer monitoring, reduction or tapering of opioids, prescribing of naloxone, or other measures to reduce risk of overdose.

Licit or Illicit Use Driving the Epidemic?

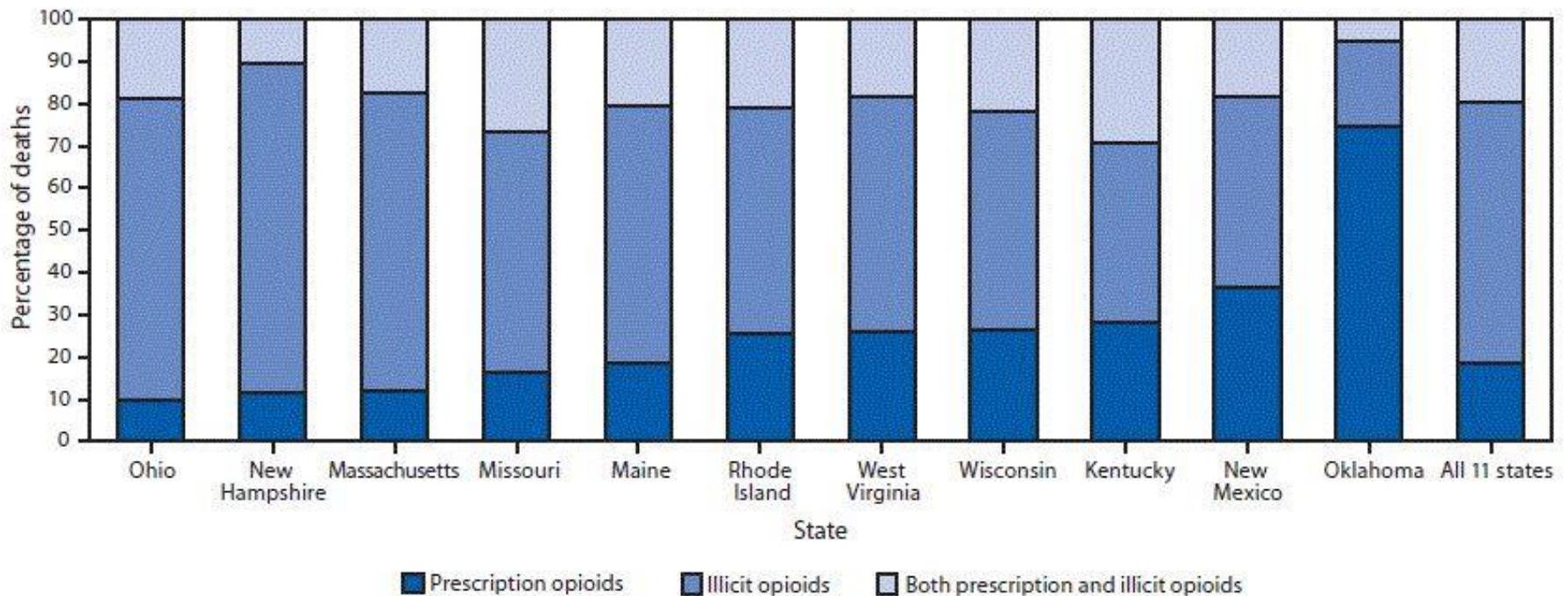


- National Academies of Sciences, Engineering, and Medicine. 2017. *Pain management and the opioid epidemic: Balancing societal and individual benefits and risks of prescription opioid use*. Washington, DC: The National Academies Press. doi: <https://doi.org/10.17226/24781>.

Proportion of Opioid Overdose Deaths

- 11 states, July 1, 2016–June 30, 2017

– Mattson et al. MMWR. 2018;67(34):945-951



Public Health Measures

- Risk awareness and education
- Safe injection sites
 - Observation prevents unattended overdoses
 - Taking drugs under supervision
- Drug testing stations:
 - Testing drugs for fentanyl contamination
 - Testing of an illicit drug for another illicit drug?

Fight Drug Abuse, Don't Subsidize It

Americans struggling with addiction need treatment and reduced access to deadly drugs. They do not need a taxpayer-sponsored haven to shoot up.

Aug. 27, 2018

By Rod J. Rosenstein

Mr. Rosenstein is the deputy attorney general of the United States.

Opioid Overdose-Reversal

- Naloxone for acute overdose
 - Prescription drug that can reverse the effects of opioid overdose and can be life-saving if administered in time.
- Sold under name *Narcan* or *Evzio*.
 - *Evzio*, a prescription treatment that can be used by family members or caregivers to treat a person known or suspected to have had an opioid overdose.
 - *Evzio* rapidly delivers a single dose of the drug naloxone via a *hand-held auto-injector*.
- Widespread distribution of naloxone — an overdose antidote — will save lives in acute cases, but naloxone can be administered “too late,” and it does not treat underlying addiction
 - Surgeon General Advisory, April, 2018

Naloxone Availability & Use In The Workplace

<https://www.cdc.gov/niosh/docs/2019-101/default.html>

Using Naloxone to Reverse Opioid Overdose in the Workplace: Information for Employers and Workers

Introduction

Opioid misuse and overdose deaths from opioids are serious health issues in the United States. Overdose deaths involving prescription and illicit opioids doubled from 2010 to 2016, with more than 42,000 deaths in 2016 [CDC 2016a]. Provisional data show that there were more than 49,000 opioid overdose deaths in 2017 [CDC 2018a]. In October 2017, the President declared the opioid overdose epidemic to be a public health emergency.

Naloxone is a very effective drug for reversing opioid overdoses. Police officers, emergency medical services providers, and non-emergency professional responders carry the drug for that purpose. The Surgeon General of the United States is also urging others who may encounter people at risk for opioid overdose to have naloxone available and to learn how to use it to save lives [USSG 2018].

The National Institute for Occupational Safety and Health



Photo by ©Thinkstock

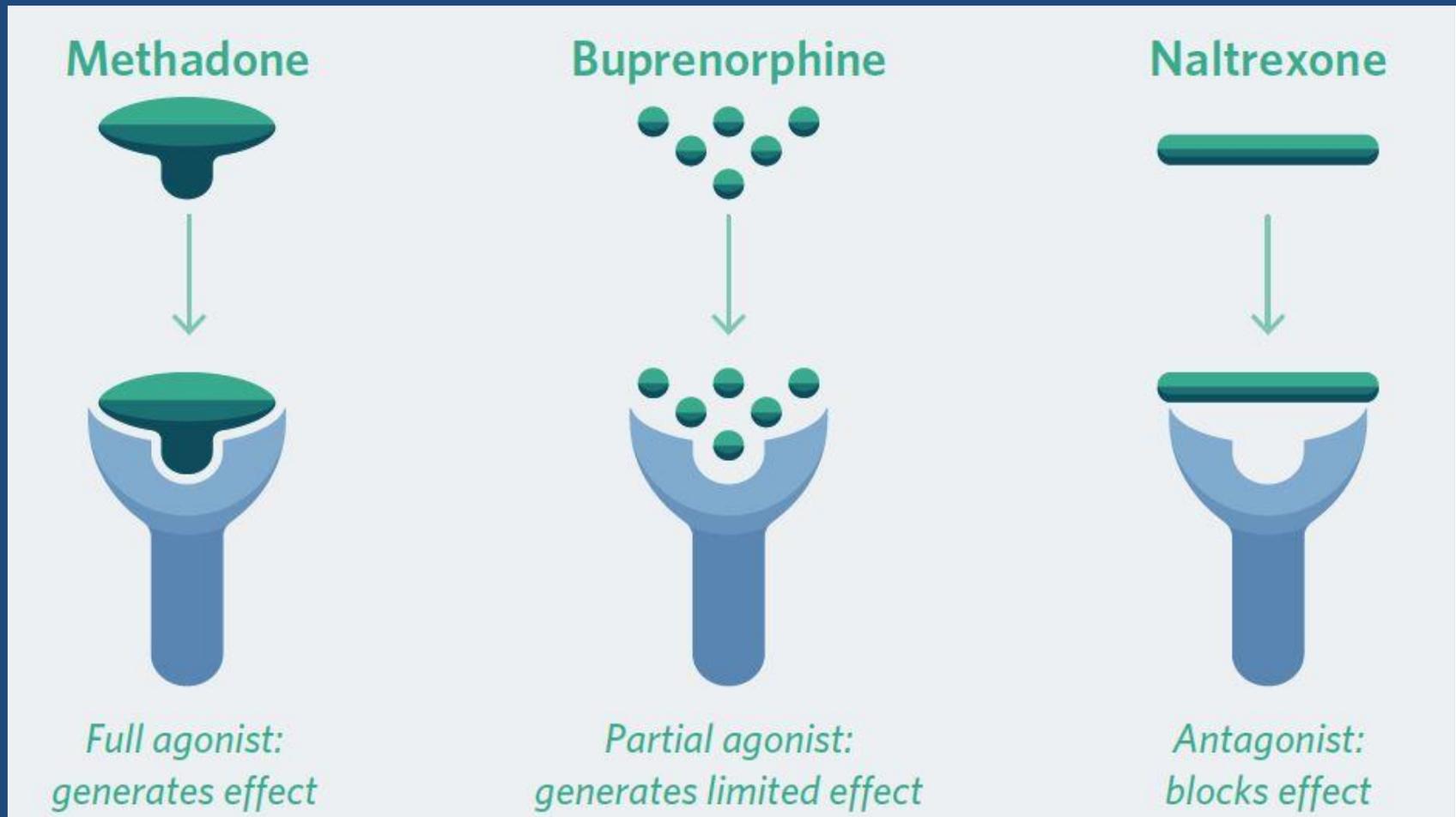
(NIOSH), part of the Centers for Disease Control and Prevention (CDC), developed this information to help employers and workers understand the risk of opioid overdose and help them decide if they should establish a workplace naloxone availability and use program.

Naloxone: Establishing a Program

- **Risk assessment:** Conduct a risk assessment before implementing the naloxone program.
- **Liability:** Consider liability and other legal issues.
- **Records Management:** Include formal procedures for documenting incidents and managing those records.
- **Staff Roles:** Define clear roles and responsibilities for all persons designated to respond to a suspected overdose.
- **Training:** Train staff to lower their risks when providing naloxone.
- **Purchasing and storing Naloxone:** Naloxone is widely available in pharmacies, follow manufacturer instructions for storing, keeping it near all other PPE (gloves, etc.).
- **Follow-up care planning:** Develop a plan for immediate care, referral, and ongoing support for any worker who has overdosed.
- **Maintenance:** Re-evaluate your program periodically, assessing for new risks

Medication Assisted Treatment

- OUD is a chronic, relapsing illness. Lifetime treatment is necessary.



Tension between Abstinence and MAT

- Research shows that staying in recovery and avoiding relapse for at least a year is more than twice as likely with medications (buprenorphine) and behavioral counseling as without them.
 - <https://www.samhsa.gov/medication-assisted-treatment/treatment>
- Currently, there is limited access to MAT:
 - Too few addiction recovery specialists;
 - Insurance coverage is limited (private insurers and Medicaid);
 - Drug treatment center leaders and 12-step programs reject idea that an addict can recover by drug substitution; and
 - Greater use of MAT negatively impacts residential drug recovery centers' revenue.

Scientific Strategies—NIH

- **Overdose Prevention and Reversal**
 - Stronger opioid antagonists to counter very-high-potency synthetic opioids
 - Novel reversal medications (5-hydroxytryptamine type 1A)
 - Phrenic nerve simulation devices
 - Technologies to detect overdose, alert for help or auto-inject naloxone
- **Treatment of Opioid Use Disorder**
 - New formulations of existing medications
 - Narcan nasal spray
 - *Probuphine*—surgically implanted device to deliver steady dose of buprenorphine
 - Novel medications and technologies—vaccines—to treat opioid addiction
- **Treatment of Chronic Pain**
 - Opioid formulations with abuse-deterrent properties to make drug difficult to manipulate for snorting or injecting
 - MOR-biased agonists (TRV130) not associated with rewarding or respiratory effects
 - Drugs that target non-opioid pain pathways like the endocannabinoid system (THC)
 - Non-pharmacologic approaches

INTERDICT Act

Signed by the President January 10, 2018

- Ensures that Customs & Border Patrol will have additional portable chemical screening devices available at ports of entry and mail and express consignment facilities, and additional fixed chemical screening devices available in CBP laboratories.
- Provides CBP with sufficient resources, personnel, and facilities – including scientists available during all operational hours – to interpret screening test results from the field.
- Authorizes – based on CBP guidance – the appropriation of \$9 million for hundreds of new screening devices, laboratory equipment, facilities, and personnel for support during all operational hours



What does work have to do with it?

Industry and Occupation Data

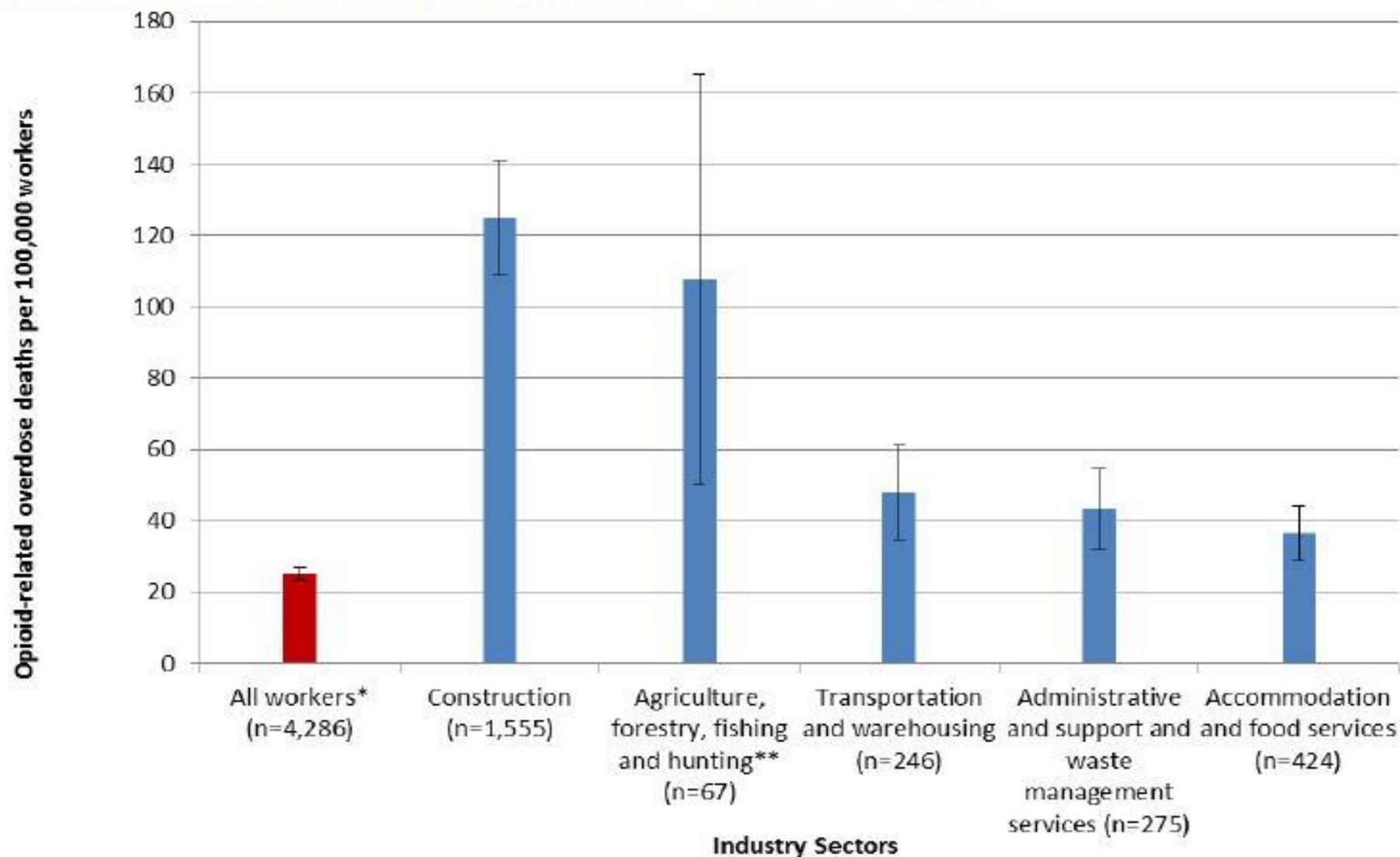


Opioid-related Overdose Deaths in Massachusetts by Industry and Occupation, 2011-2015

Summary and Key Findings

- Construction and extraction workers had both a high rate (150.6 deaths per 100,000 workers) and a high number of opioid-related overdose deaths (n=1,096).
- Opioid-related death rate for those employed in construction and extraction occupation was six times the average rate for all Massachusetts workers (25.1).
- Construction and extraction workers accounted for more than 24% of all opioid-related deaths among the working population (n=4,302).

Figure 1. Industry sectors with opioid-related overdose death rates significantly higher than the average rate for all workers, Massachusetts workers, 2011-2015, n=4,302



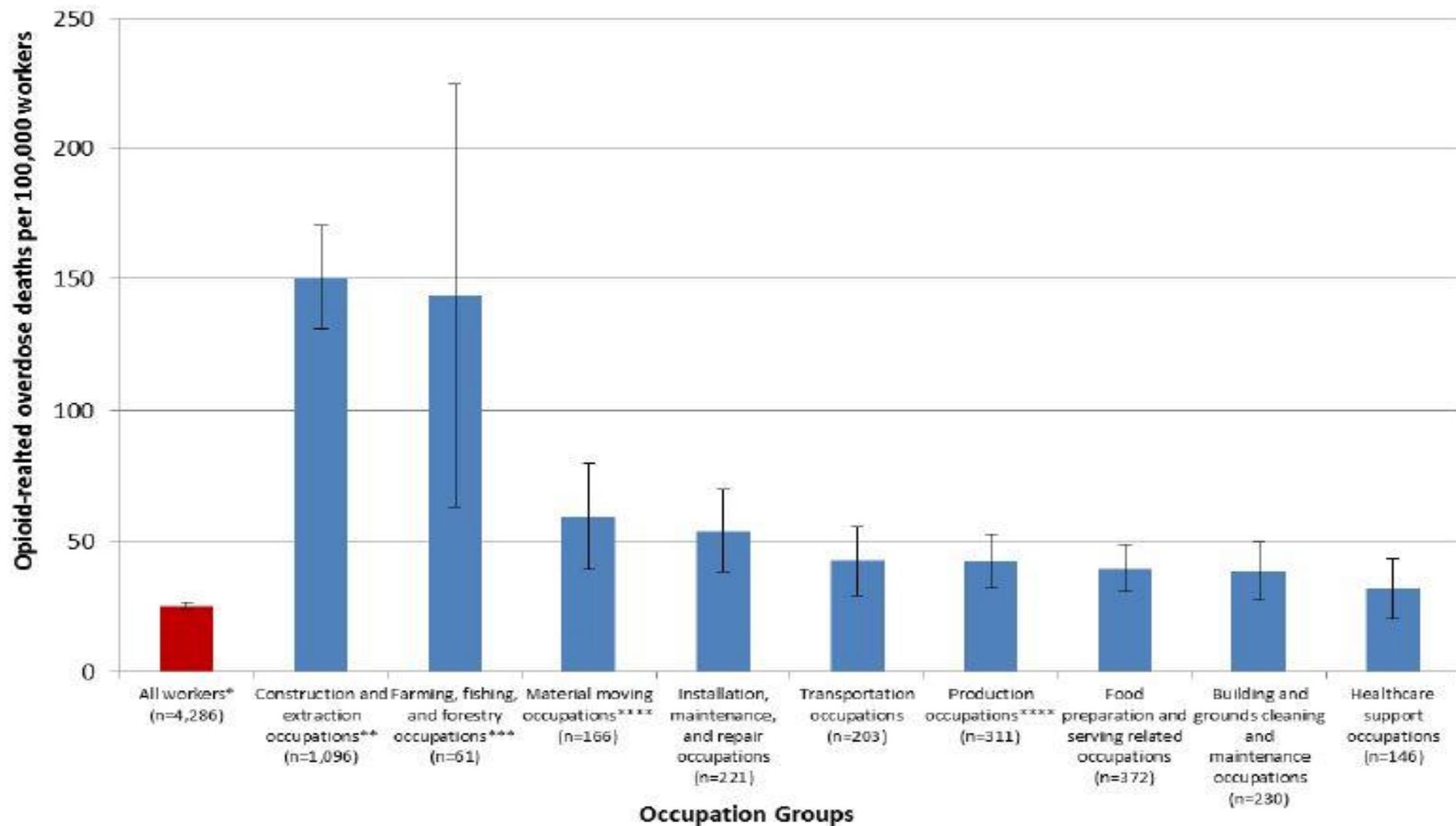
* This category excluded 16 deaths among those working in the military or military specific occupations due to lack of denominator information

** 67.2% of these deaths occurred among workers employed in fishing occupations.

Numerator source: Occupational Health Surveillance Program, 2011-2015

Denominator source: American Community Survey, 2011-2015

Figure 2. Occupation groups with opioid-related overdose death rates significantly higher than the average rate for all workers, Massachusetts workers, 2011-2015, n=4,302



* This category excluded 16 deaths among those working in the military or military specific occupations due to lack of denominator information.

** At least 97.0% of these deaths occurred among workers employed in construction occupations.

*** 73.8% of these deaths occurred among workers employed in fishing occupations.

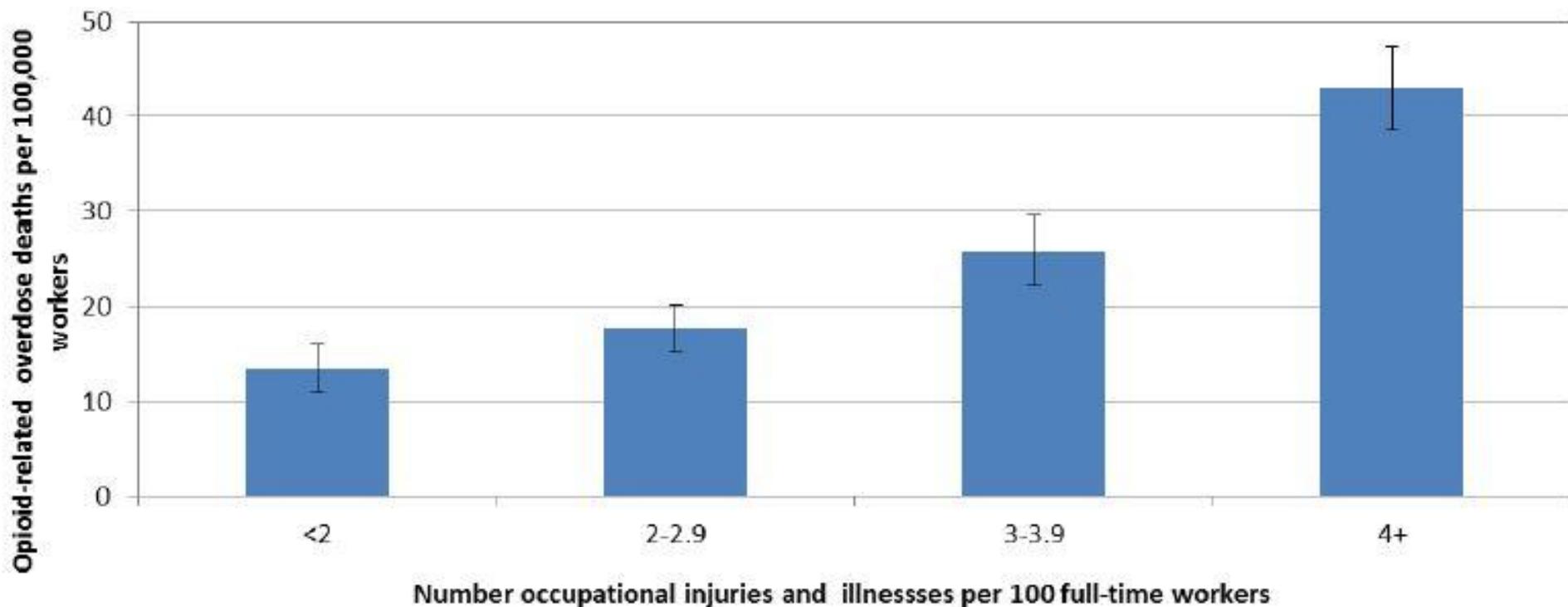
**** This category excludes 1 death among a worker employed in the military industry.

Numerator source: Occupational Health Surveillance Program, 2011-2015

Denominator source: American Community Survey, 2011-2015

Opioid-Related Overdose Deaths and Number of Occupational Injury and Illnesses

Figure 4. Rate of opioid-related overdose deaths among Massachusetts workers by industry-specific injury and illness rate category, 2011-2015, n=4,302*



* The figure excludes 16 deaths among those working in the military or military specific occupations and 29 deaths with unknown industry, which lacked corresponding denominators.

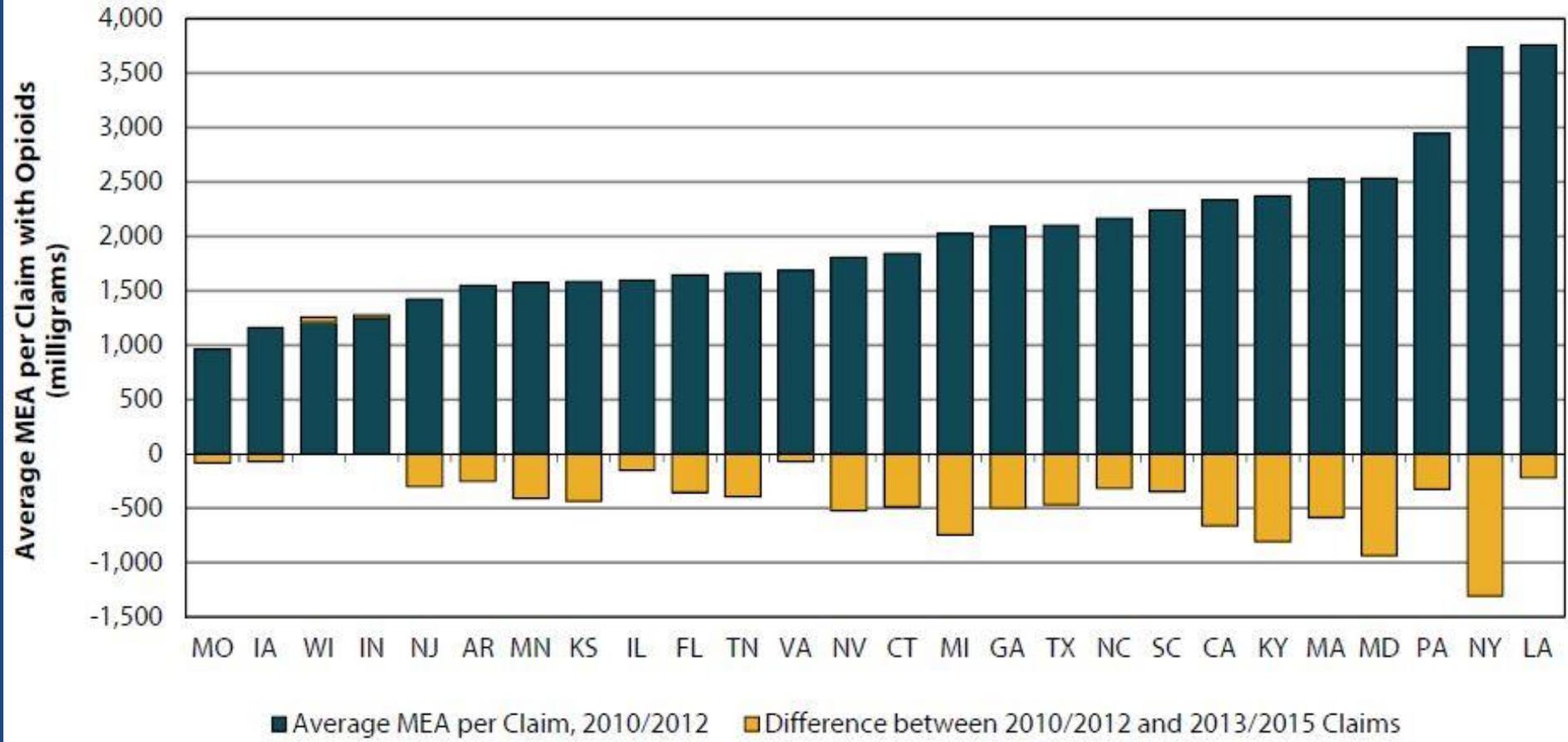
Numerator source: Occupational Health Surveillance Program, 2011-2015

Denominator source: Bureau of Labor Statistics, MA Survey of Occupational Injuries and Illnesses, industry, 2015

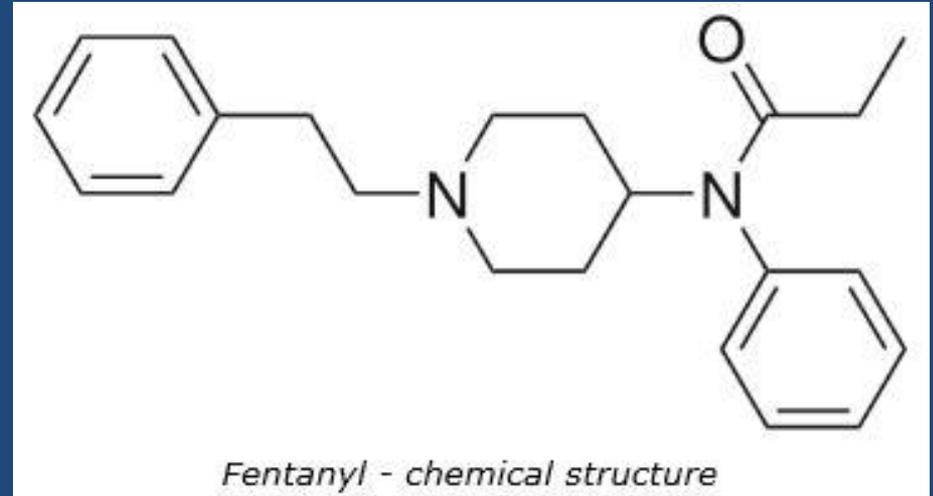
Pain Management and Workers' Compensation

- Pain management following work-related injuries has the potential to lead to opioid use disorders.
 - Franklin et al. Early opioid prescription and subsequent disability among workers with back injuries: the Disability Risk Identification Study Cohort. *Spine*. 2008;33(2):199-204.
 - Dembe et al. Opioid use and dosing in the workers' compensation setting. A comparative review and new data from Ohio. *AJIM*. 2012;55(4):313-324.

Change in Average MEA per Claim with Opioids — 2010/2012—2013/2015



Fentanyl & First Responders



Fentanyl

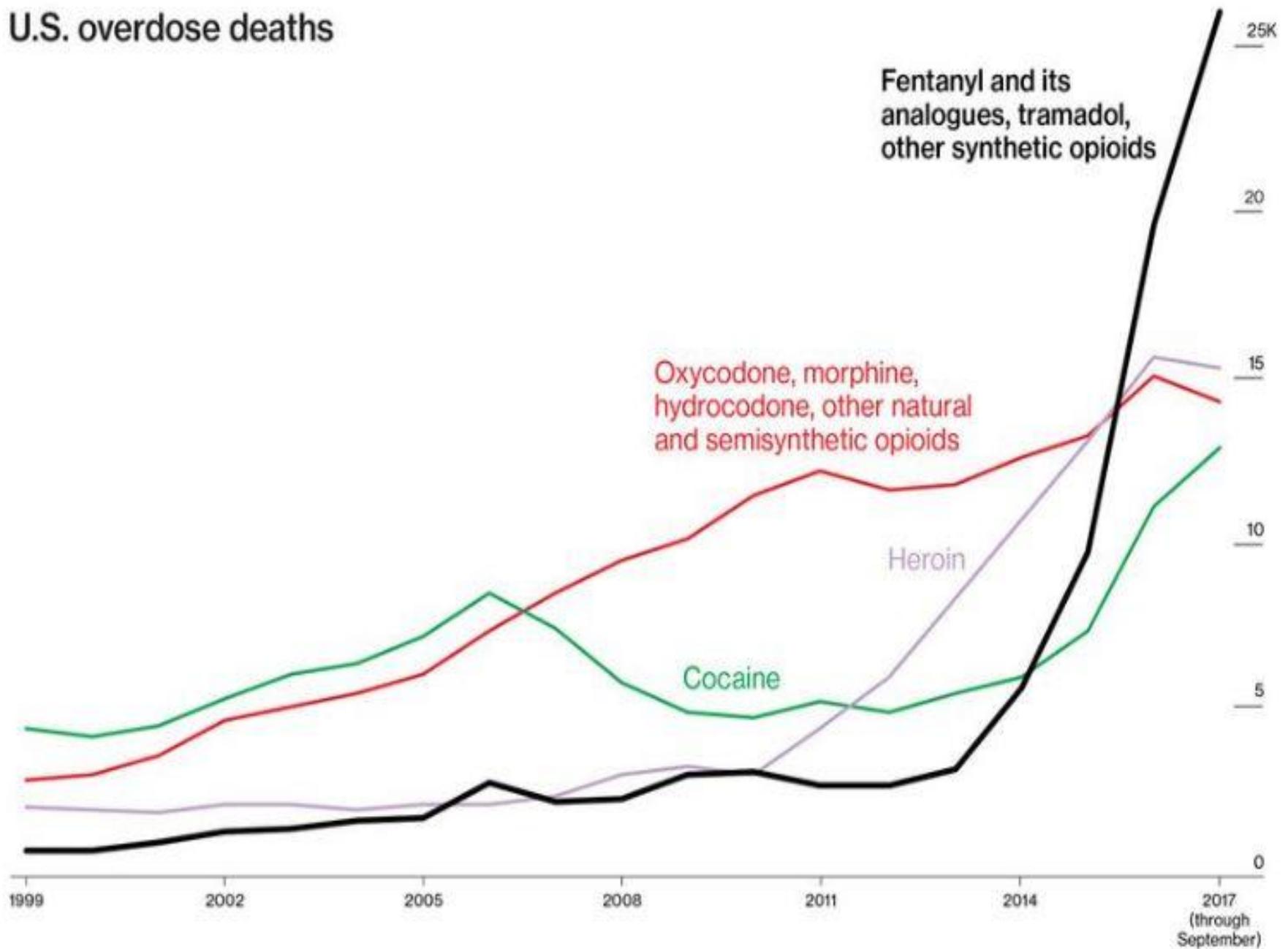
- **Potency**
 - Fentanyl 50X to 100X more potent than morphine
 - Frames the “hazard” potential for mitigation of occupational exposure
 - Schedule II prescription drug used to treat cancer patients and patients with severe pain or post-surgery pain.
- Responders are finding that with overdoses involving fentanyl and carfentanil, the overdoses can be so severe that multiple doses of naloxone are needed.
- Naloxone remains an effective reversal agents, but:
 - May be administered too late to restore breathing; or
 - Drug taken by the person was not an opioid.

Moscow Theater Hostage Crisis



- On October 26, 2002, Russian Special Forces deployed a chemical aerosol against Chechen terrorists to rescue hostages in the *Dubrovka* theatre.
- Its use confirmed Russian military interest in chemicals with effects on personnel and caused 125 deaths through a combination of the aerosol and inadequate medical care.
- A study provided evidence from liquid chromatography–tandem mass spectrometry analysis of extracts of clothing from two British survivors, and urine from a third survivor, that the aerosol comprised a mixture of two anesthetics—*carfentanil* and *remifentanil*—whose relative proportions this study was unable to identify.
 - Riches JR. et al. *Journal of Analytical Toxicology*. 2012;36:647-656.

U.S. overdose deaths



Source: Centers for Disease Control and Prevention

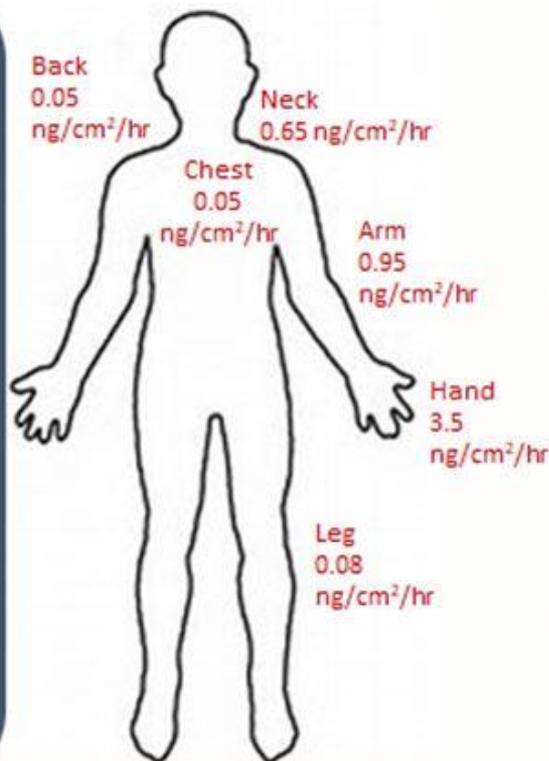
Bloomberg

Exposure Studies: Pharma Production Workers

Van Nimmen et al. *Ann Occup Hyg* (2006)

Minimize Exposure – Case Study

- 5 batches of 30 kg of fentanyl were synthesized
- During all bulk operations (centrifuging, drying, and packaging), the workers wore an encapsulated suit with supplied air
- During non-bulk operations (synthesis, filtration, and sampling), the workers wore disposable Tyvek® coveralls, boot covers, nitrile gloves, and a full facepiece-APR.



An average of 30 µg fentanyl was deposited UNDER the protective equipment during non-bulk operations (on each person). Therefore, particulate tight PPE should be worn.

- 79% of all urine samples showed measurable levels of fentanyl [Due to Dermal Penetration]
- 24 ng/g creatinine: The mean urinary fentanyl (ng/g creatinine) levels in worker's urine samples, collected during a 3 week fentanyl production campaign

REF: Van Nimmen et al., *Ann. Occup. Hyg.*: 50(7), 2006

First Responder Incidents

- Reports of responders experiencing health effects during opioid overdose victim incidents
- Health effects reported are NOT classic opioid overdose symptoms and signs such as apnea, stupor and miosis
 - Responders report feeling “unwell,” “nauseous,” “lightheaded,” “dizzy,” “feeling like I was going-down”
 - Witnesses have often described responders “going down to the ground.”
- Some responders given naloxone at the scene with variable responses.

Promoting productive workplaces
through safety and health research



- Workplace Safety & Health Topics
- Opioids -
- NIOSH's Framework
- Data
- Field Investigations
- Research
- Resources +
- Using Naloxone to Reverse Opioid Overdose in the Workplace: Information for Employers and Workers

[NIOSH](#) > [Workplace Safety & Health Topics](#) > [Opioids](#)

Opioids



Field Investigations

The NIOSH Health Hazard Evaluation Program has been working to better understand work-related exposures and potential health risks among emergency responders (*including emergency medical service, fire-fighting, and law enforcement personnel*) and other groups of workers impacted by the opioid crisis.

[Fentanyl Resources](#)



New Final and Interim Health Hazard Evaluation Reports

- [Evaluation of Law Enforcement Officers' Potential Occupational Exposure to Illicit Drugs – Virginia \(HHE 2018-0113-3325\)](#) 📄 - Final Report (September 2018)
- [Evaluation of a New Hampshire Law Enforcement Officer's Unintentional Occupational Exposure to Illicit Drugs \(HHE 2018-0132-3322\)](#) 📄 - Final Report (August 2018)
- [Evaluation of Potential Occupational Exposures to Opioids in a City Fire and Police Department \(HHE 2018-0015\)](#) 📄 - Interim Report (May 2018)
- [Evaluation of Potential Occupational Exposures to Opioid Drugs During a Law Enforcement and Emergency Medical Services Response \(HHE 2018-0083\)](#) 📄 - Interim Report (April 2018)
- [Evaluation of Potential Occupational Exposures to Opioid Drugs During an Emergency Medical Services Response \(HHE 2018-0067\)](#) 📄 - Interim Report (April 2018)

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Responders and Opioids

- Unclear whether cause of responders health effects is exposure to mixture of opioids and stimulants at the incident or anxiety resulting from risk perception, or a combination of both
- NIOSH is conducting field investigations.
- Regardless of the causation, protective strategies need to be implemented.

Authoritative Recommendations

- **White House Safety Recommendations for First Responders**
 - Fentanyl. Safety Recommendations for First Responders. 2017.
<https://www.whitehouse.gov/ondcp/key-issues/fentanyl>
- **Drug Enforcement Administration**
 - A briefing guide for first responders. U.S. Department of Justice. 2017
- **The Interagency Board**
 - Recommendations on selection and use of personal protective equipment and decontamination products for first responders against exposure hazards to synthetic opioids, including fentanyl analogues. August, 2017.
- **NIOSH**
 - Howard J & Hornsby-Myers J. Fentanyls and first responders: science and recommendations. *AJIM*. 2018:1-7.
- **American College of Medical Toxicology/American Academy of Clinical Toxicology**
 - Moss MJ, Warrick BJ, Nelson LS, et al. ACMT and AACT position statement: preventing occupational fentanyl and fentanyl analog exposure to emergency responders *Clin Toxicol* 2018;56:297–300.

First Responder Guidance

- Interagency group under the direction of the National Security Council.
- Actions first responders can take to protect themselves from exposure.
- Actions first responders can take when exposure occurs.
- Actions first responders can take when they or their partners exhibit signs of intoxication.

FENTANYL[†]

SAFETY RECOMMENDATIONS FOR FIRST RESPONDERS

[†] For the purposes of this document, fentanyl, related substances, and synthetic opioids (herein after referred to as fentanyl[†]) includes fentanyl analogues (e.g., acetylfentanyl, acrylfentanyl, carfentanil, furanylfentanyl), novel synthetic opioids (e.g., U-47700), and other drugs that may be laced with these substances.

- ▶ **The abuse of drugs containing fentanyl[†] is killing Americans. Misinformation and inconsistent recommendations regarding fentanyl[†] have resulted in confusion in the first responder community.**
- ▶ You as a first responder (law enforcement, fire, rescue, and emergency medical services (EMS) personnel) are increasingly likely to encounter fentanyl[†] in your daily activities (e.g., responding to overdose calls, conducting traffic stops, arrests, and searches).
- ▶ This document provides scientific, evidence-based recommendations to protect yourself from exposure.

WHAT YOU NEED TO KNOW

- ▶ Fentanyl[†] can be present in a variety of forms (e.g., powder, tablets, capsules, solutions, and rocks).
- ▶ Inhalation of airborne powder is **MOST LIKELY** to lead to harmful effects, but is less likely to occur than skin contact.
- ▶ Incidental skin contact may occur during daily activities but is not expected to lead to harmful effects if the contaminated skin is promptly washed off with water.
- ▶ Personal Protective Equipment (PPE) is effective in protecting you from exposure.
- ▶ Slow breathing or no breathing, drowsiness or unresponsiveness, and constricted or pinpoint pupils are the specific signs consistent with fentanyl[†] intoxication.
- ▶ Naloxone is an effective medication that rapidly reverses the effects of fentanyl[†].

Actions to take ...

To protect yourself from exposure

- ▶ Wear **gloves** when the presence of fentanyl[†] is suspected.
- ▶ **AVOID actions that may cause powder to become airborne.**
- ▶ Use a properly-fitted, NIOSH-approved **respirator ("mask")**, wear **eye protection**, and minimize skin contact when responding to a situation where small amounts of suspected fentanyl[†] are visible and may become airborne.
- ▶ Follow your department guidelines if the scene involves large amounts of suspected fentanyl[†] (e.g., distribution/storage facility, pill milling operation, clandestine lab, gross contamination, spill or release).

When exposure occurs

- ▶ Prevent further contamination and notify other first responders and dispatch.
- ▶ Do not touch your eyes, mouth, nose or any skin after touching any potentially contaminated surface.
- ▶ Wash skin thoroughly with cool water, and soap if available. **Do NOT use hand sanitizers as they may enhance absorption.**
- ▶ Wash your hands thoroughly after the incident and before eating, drinking, smoking, or using the restroom.
- ▶ If you suspect your clothing, shoes, and PPE may be contaminated, follow your department guidelines for decontamination.

If you or other first responders exhibit

- **Slow Breathing or No Breathing**
- **Drowsiness or Unresponsiveness**
- **Constricted or Pinpoint Pupils**
- ▶ Move away from the source of exposure and call EMS.
- ▶ Administer naloxone according to your department protocols. Multiple doses may be required.
- ▶ If naloxone is not available, rescue breathing can be a lifesaving measure until EMS arrives. Use standard basic life support safety precautions (e.g., pocket mask, gloves) to address the exposure risk.
- ▶ If needed, initiate CPR until EMS arrives.



Collaborative Support From:

American College of Emergency Physicians
 American College of Medical Toxicologists
 American Industrial Hygiene Association
 Association of State and Territorial Health Officials
 Association of State Criminal Investigative Agencies
 Fraternal Order of Police



International Association of Chiefs of Police
 International Association of Fire Chiefs
 International Association of Fire Fighters
 Major Cities Chiefs Association
 Major County Sheriffs of America
 National Alliance of State Drug Enforcement Agencies

National Association of Counties
 National Association of County and City Health Officials
 National Association of Emergency Medical Technicians
 National Association of EMS Physicians
 National Association of State EMS Officials

National Governor's Association
 National HDTA Directors Association
 National Healthcare Officers' Association's Coalition
 National Sheriff's Association
 National Volunteer Fire Council
 Police Executive Research Forum
 Police Foundation

NIOSH Fentanyl Guidance

<https://www.cdc.gov/niosh/topics/fentanyl/risk.html>

The National Institute for Occupational Safety and Health (NIOSH)

Workplace Safety & Health Topics

Fentanyl

Protecting Workers at Risk

Illegal Use of Fentanyl

Resources

Promoting productive workplaces through safety and health research



[NIOSH](#) > [Workplace Safety & Health Topics](#)

Fentanyl: Preventing Occupational Exposure to Emergency Responders



Overview

Fentanyl is a powerful synthetic drug that is similar to morphine and heroin but is 50 to 100 times more potent. Fentanyl and its analogs are members of the class of drugs known as rapid-acting synthetic opioids that alleviate pain. Other drugs in this class include fentanyl analogs, such as acetylfentanyl, butyrfentanyl, carfentanil, alfentanil, sufentanil and remifentanil. Fentanyl acts quickly to depress central nervous system and respiratory function. Exposure to fentanyl may be fatal.

The U.S. Drug Enforcement Administration (DEA) classifies fentanyl and some of its analogs as schedule II prescription drugs, which are typically used to treat patients with severe pain or to manage pain after surgery. They are sometimes used to treat patients with chronic pain who are physically tolerant to other opioids; however per the [CDC Guideline for Prescribing Opioids for Chronic Pain](#), only clinicians who are familiar with the dosing and absorption

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Exposure Routes and Risk: Inhalation

- Powder-like fentanyl may become airborne by disturbing surfaces, brushing powder from clothing, or other incidental activities that cause aerosolization.
- First responders entering an environment where airborne particles are *not suspected or confirmed*, but small amounts of powder are visible, should wear an N-100, P-100, or R-100 respirator. Since no occupational exposure limit has been established for fentanyl, using the filter with the highest efficiency, and reducing face seal leakage as much as possible through proper fit testing and training, provides effective respiratory protection.
- First responders entering an environment where airborne fentanyl are *strongly suspected or confirmed* to be present should wear a supplied air respirator (SAR) or self-contained breathing apparatus (SCBA) to provide maximal protection.

Exposure Routes and Risk: Mucous Membranes

- Inadvertent contact of fentanyls with the mucous membranes of the eye, nose or mouth presents an equivalent hazard to inhalation.
- Fentanyl is 65% bioavailable when delivered by buccal or sublingual administration—a 40 μg buccal tablet leads to similar plasma concentrations (1 ng/mL) as a 10 mg transdermal patch in substantially less time (45 min vs 72 h).

Exposure Routes and Risk: Dermal

- Fentanyl has been known to be able to penetrate human skin due to its lipophilicity and low molecular weight. However, dermal exposure to fentanyl may be of more importance in chronic, low-level occupational exposure than in the acute, low-level exposures that are typical of emergency response incidents.
- A prudent prevention measure to prevent transdermal exposure is to wear non-powder, nitrile gloves, 5 ± 2 mm (mil) thickness, to protect against transdermal exposure.
- If the skin becomes contaminated, skin should be washed promptly with soap and copious amounts of water. Soap solubilizes fentanyl, which is poorly soluble in plain water, and soap aids in decreasing surface attraction, making fentanyl more easily removable from the surface of contaminated skin.
- Use of hand sanitizers and hand wipes should be avoided as their use may spread the fentanyl to previously uninvolved skin areas.

Exposure Routes and Risk

- **Ingestion**

- Where fentanyl is suspected or confirmed to be present, it is prudent for responders not to eat, drink, or smoke. In addition, touching the mouth after touching contaminated objects or equipment can result in ingestion of opioids.

- **Percutaneous**

- Potential exposure to opioids may occur through the percutaneous route if contaminated needles or sharps penetrate intact skin. Multiple incidents of parenteral exposure through handling injectable anesthetics containing highly potent fentanyl and other tranquilizing agents used in veterinary medicine has been reported in the literature and in an online survey.

Qualitative Exposure Assessment

- **Minimal:** Response to a situation where it is suspected that fentanyl may be present but no fentanyl products are visible
 - *Example:* An EMS response to a suspected fentanyl overdose or law enforcement operation where intelligence indicates fentanyl products are suspected but are not visible on scene
- **Moderate:** Response to a situation where small amounts of fentanyl products are visible
 - *Example:* An EMS response to a suspected fentanyl overdose or law enforcement operation where fentanyl products are suspected and small amounts are visible on scene
- **High:** Response to a situation where liquid fentanyl or large amounts of fentanyl products are visible
 - *Example:* A fentanyl storage or distribution facility, fentanyl milling operation, or fentanyl production laboratory

PPE Recommendations for Protection Against Fentanyl

Personal Protective Equipment	Pre-Hospital Patient Care			Law Enforcement Routine Duties			Investigations and Evidence Collection			Special Operations and Decontamination			
	Exposure Level	Minimal	Moderate	High	Minimal	Moderate	High	Minimal	Moderate	High	Minimal	Moderate	High
<i>Respiratory Protection</i>													
Disposable N100, R100, or P100 FFR ¹		✓				✓			✓			✓	
Elastomeric APR ²								●	✓			●	✓
PAPR ³									●			●	●
SCBA ⁴									■				■
<i>Face and Eye Protection</i>													
Safety goggles/glasses ⁵		✓				✓		✓	✓			✓	✓
<i>Hand Protection</i>													
Nitrile gloves ⁶		✓	✓		✓	✓		✓	✓		✓	✓	
Nitrile gloves, double or use of thicker gloves			●			●		●	●			●	✓
<i>Dermal Protection</i>													
Wrist/arm protection ⁷			✓			✓		✓				✓	
Particulate hazards protective ensemble (i.e., NFPA 1999 Single or Multi-Use or NFPA 1994 Class 4 Ensemble)									✓				✓
Chemical hazards protective ensemble (i.e., NFPA 1994 Class 3 Ensemble or Higher)									●				●

Not recommended

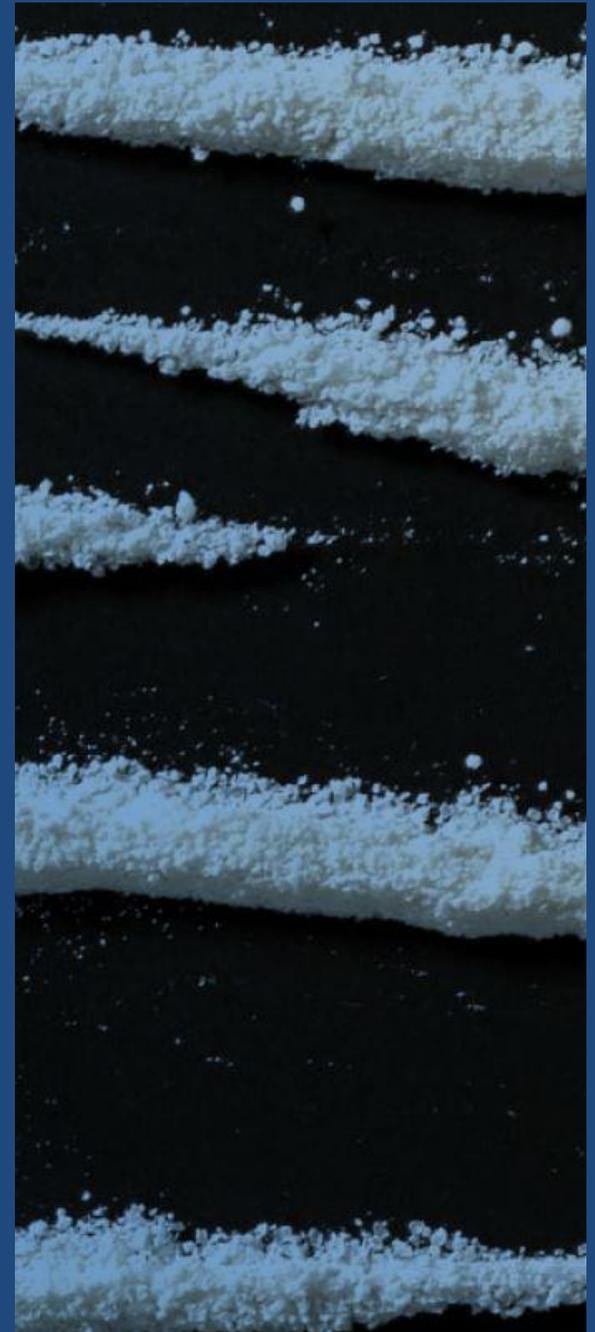
Not recommended

SUPPORT for Patients and Communities Act

- TITLE VII—Public Health Provisions, Subtitle A—Awareness and Training.
 - SEC. 7002. First Responder Training
 - Section 546 of the Public Health Service Act (42 14 U.S.C. 290ee–1) is amended to “train and provide resources for first responders and members of other key community sectors on safety around fentanyl, carfentanil, and other dangerous licit and illicit drugs to protect themselves from exposure to such drugs and respond appropriately when exposure occurs.
 - “\$36,000,000 for each of fiscal years 2019 through 2023”.

Summary

- Opioid use disorders and overdose deaths continue at epidemic levels.
- Opioid prescribing rates since 2012 suggest providers are responding and illicit use may be a **stronger** driver of use.
- Supply-side and demand-side interventions are needed
 - Prescribing controls by connecting provider, pharmacy and patient
 - Interrupting illicit supply
 - Promoting opioid use disorder recovery through wider availability of long-term MAT
 - Developing non-opioid pain therapies
 - More attention to the workforce issues



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