BASIC DRUG USE EPIDEMIOLOGY
A GUIDE

CDC Foundation
Together our impact is greater

Vital
Strategies

Basic Drug Use Epidemiology: A Guide

Authors

Eric Hulsey, DrPH, MA
Vital Strategies

Sarisa Roe, MPH
The CDC Foundation

August 2022

Acronyms

CMS	Centers for Medicare and Medicaid Services
DEA	Drug Enforcement Administration
DOSE	CDC's Drug Overdose Surveillance and Epidemiology System
ED	Emergency Department
EMS	Emergency Medical Service
HIDTA	High Intensity Drug Trafficking Area
HIPAA	Health Insurance Portability and Accountability Act
MOUD	Medications for Opioid Use Disorder
NSDUH	National Survey on Drug Use and Health
NSSP	CDC's National Syndromic Surveillance Program
OD2A	CDC'S Overdose Data to Action
ODMAP	Overdose Detection Mapping Application Program
OUD	Opioid Use Disorder
PDMP	Prescription Drug Monitoring Program
PHAST	CDC's Public Health and Safety Team Toolkit
SAMHSA	Substance Abuse and Mental Health Services Administration
SAPT-BG	Substance Abuse Prevention and Treatment Block Grant
SSP	Syringe Services Program
SUD	Substance Use Disorder

Basic Drug Use Epidemiology: A Guide

Purpose

The purpose of this document is to provide guidance to local and regional stakeholders working to improve their capacity to analyze and report data about drug use and overdose. It was developed as a supplemental tool for the Centers for Disease Control and Prevention (CDC's) Public Health and Safety Team (PHAST) Toolkit to support multi-sector teams in selecting and using overdose-related metrics to inform local overdose prevention and response efforts. Because most overdoses in the U.S. involve an opioid, this guide is primarily focused on opioid-related indicators. However, as the number of overdoses involving stimulants and other drug types have increased, guidance towards monitoring these, and other emerging trends, are also included.

Aim

The aim of this guide is to help your team improve its capabilities for public health surveillance and epidemiology whether at the local, regional or state levels to offer analyses that guide effective stakeholder decision-making.

Target Audience

There are several target audiences for this guide including:

- Trained epidemiologists and other staff working in local and state health departments who may be responsible for data analysis but who may not have expertise or access to expertise on the topic of drug use and accidental overdose.

- Local, regional and national stakeholders who are investing resources to reduce overdose risk and want to target their efforts to maximize the impact of their chosen interventions.

- Analysts working within healthcare systems that have an interest in population health data to inform the planning of treatment interventions.

How to Use This Guide

This document was designed to be used as a guide to orient those who are engaged in preparing, analyzing and producing actionable data to reduce overdose risks. Whether you and your team are embarking on an initial report about the state of overdoses in your region or enhancing what your team has already accomplished, this guide offers suggestions about key questions you may want to ask, how to locate or gain access to data that might be available, how to calculate and present the results, and practice-informed interpretations and use of your findings.

Suggestions are offered throughout the guide on data stratification and encourage users to disaggregate the data they analyze. Increasingly in the U.S., non-white populations are experiencing disproportionate rates of overdose.[1] Similarly, there may be an opportunity to identify specific trends in overdoses by age groups and sex. To ensure that analyses are accurate in identifying potential inequities in overdoses and provide effective guidance to select targeted interventions, it is critical to ask of the data "who" is experiencing overdoses in the region.

As a first step, we suggest the reader scans the document to gain familiarity with the guide. Then, thinking about what you would like to include in your report, identify one of the Key Investigation Questions most closely related to it. Finally, identify the indicators associated with the Key Investigation Question you selected and review the information contained in the indicator tables. A description of each category included in each indicator table is provided below to explain how we have organized this information:

Indicator
Drug-related measure of interest.

Key Investigation Question
Broader questions that this indicator can help to inform. Each Key Investigation Question has a corresponding number that is shown in the table. A list of Key Investigation Questions can be found here.

Stratification
Different ways that this indicator can be examined to better understand if and how subgroups are differentially impacted by drug overdose.

Definition
Definition of the indicator that you are calculating.

Suggested Use
Suggestions that were gathered and synthesized from experiences in jurisdictions in the U.S. that have used these data in overdose reporting.

Reporting Frequency
Describes how often your team may want to update your reporting, dashboards, etc.

Rationale
A brief explanation about why this indicator is important and what it might help to communicate to your audience or stakeholders.

Suggestions for Securing Data
Strategies that can be used to try to gain access to data for purposes of basic drug overdose epidemiology.

Possible Data Sources
Suggestions about where to locate available data, whether federal or more local data. Note that many sources present challenges for timely reporting of overdose information and there will often be a lag (sometimes substantial) in the available data, especially mortality data. Consider each source's data lag and state limitations in reporting.

Data Owners
Describes typical owners of possible data sources for further investigation. Analysts may consider contacting these agencies or sectors directly to inquire about data sources and data access.

Suggestions and Limitations in Interpreting This Data
Practice-based experiences in how your team might interpret its findings as well as otherwise sound acknowledgements of some of the limitations to interpreting your results.

Examples and References
Examples of how other jurisdictions have represented or visualized their results and additional literature, guidance, or sources related to this indicator.

Privacy Considerations and Best Practices

Adhering to federal, state, and local privacy laws are critical elements of data sharing, use, and presentation. Before collecting, analyzing, and presenting local overdose data, users of this guide are encouraged to review and understand applicable privacy laws. The two primary federal laws most relevant to overdose data are:

- **HIPAA** – The Health Insurance Portability and Accountability Act establishes the national minimum standard for the collection, use, storage, and disclosure of protected health information (PHI). PHI includes all medical records and identifiable health information such as a person's name, address, and other personal characteristic that could uniquely identify the individual.
- **42 CFR Part 2** – United States Code of Federal Regulations Title 42 Part 2 governs the use and disclosure of patients' substance use disorder treatment records maintained by any federally assisted program. These privacy protections generally prohibit the disclosure of patient records without the patient's consent.

Some states and local entities may have additional regulations governing these data. Determining if and how privacy laws apply in any scenario may require additional consultation with your organization's privacy officer or legal consultant. Users of this guide are encouraged to discuss all proposed efforts to collect or access new overdose-related data sources and standards for data presentation before proceeding.

Analysts are also encouraged to adopt best practices related to data sharing and presentation to prevent the unintentional disclosure of personally identifiable information. Managing and reporting drug use and fatality data could have some risk of disclosing sensitive information, especially in a geographic area where there may be few observational (e.g., overdose) events.

Suggestions for best practices include:

- Consider adopting suppression rules such as refraining from reporting counts fewer than 10 observations or rates when there are less than 20 observations.
- If developing a data map of overdose incidents, consider presenting it as a heat map rather than displaying exact locations of incidents.

For more information on data sharing, visit the following resource by ChangeLab Solutions: Leveraging Data Sharing for Overdose Prevention (https://www.changelabsolutions.org/sites/default/files/2020-07/LeveragingDataSharingfor OverdosePrevention_accessible_FINAL_20200707.pdf)

Key Investigation Questions and Associated Indicators

The following Key Investigation Questions aim to provide an overarching focus and direction for how indicators included in this guide can be used to help jurisdictions improve their understanding of the local overdose crisis. By asking and answering key questions, stakeholders can increase their collective understanding of the local crisis, identify local gaps and needs, and use data to inform decision making.

As a supplement to the PHAST Toolkit, the Key Investigation Questions listed here are also included in the PHAST Toolkit's Data Inventory Table. Jurisdictions may use this guide as a more detailed resource to inform their approach to accessing and securing data, calculating and presenting results, and interpreting findings as they work towards developing a collaborative multi-sector approach to overdose prevention, recovery, and response.

Table 1 lists Key Investigation questions and identifies the associated indicators that may be used to address each question. Each question is assigned a number that is referenced throughout this document. Table 2 lists each indicator and identifies the associated Key Investigation Questions that the indicator may be used to answer. While both tables contain the same information, they offer different perspectives of approaching this information. Please note that this guide does not provide an exhaustive list of all key investigation questions or all possible indicators. Users of the guide are encouraged to explore additional investigation questions as they arise and consider other potential indicators based on available local data, including qualitative data sources.

Table 1. Key Investigation Questions with Indicators

#	Key Investigation Question	Indicator
1	What is the opioid-related overdose death rate?	# and rates of fatal overdose
2	Where are the deaths happening?	# of overdose- (or drug-) related EMS dispatches and/or 911 calls
		# and rates of fatal overdose
3	What is the non-fatal overdose rate?	#, rate, and % of syndromic emergency department (ED) visits related to suspected overdoses
		#, rate, and % of overdose- (or drug-) related EMS dispatches and/or 911 calls
		#, rate, and % of naloxone administrations reported by first responders during overdose-related dispatches
4	Are we seeing a spike in overdoses or a particular type of overdose?	# of syndromic ED visits related to suspected overdoses over time
		# and rates of fatal overdose over time
5	Who is overdosing and in need of services?	# of syndromic ED visits related to suspected overdoses by patient demographics
		# and rates of fatal overdose by patient demographics
		# & % of individuals formerly incarcerated who experienced a fatal overdose within 90 days following jail release
		% of people with opioid use disorder (OUD) in specialty treatment for OUD using medications for opioid use disorder (MOUD)
6	What are the limitations in the current overdose prevention services?	# of naloxone kits distributed
		# & % of individuals released from jail or prison with OUD who received a naloxone kit upon release
		# of prescribers with X-waiver
		% of people with OUD in specialty treatment for OUD using MOUD
		# of syringe exchange programs/ syringe service programs
7	What are the local trends in illicit drug use?	% of population with OUD
		# & % of individuals currently incarcerated who screened positive for opioid use
		# and rate of fatal overdose by drug class
		#, rate, and % of syndromic ED visits related to suspected overdoses by drug class
8	What is in the local drug supply?	Emerging trends in local drug supply
9	What are the local opioid prescribing practices/trends?	# of people receiving opioid prescriptions

Table 2. Indicators with Key Investigation Questions

Indicator	Key Investigation Question #
Percent of population with opioid use disorder (OUD)	7
Number and rates of fatal overdose	1,2,4,5,7
Number of syndromic emergency department (ED) visits related to suspected overdoses	3,4,5,7
Number of overdose- (or drug-) related Emergency Medical Service (EMS) dispatches and/or 911 calls	2,3
Number and percent of naloxone administrations reported by first responders during overdose-related dispatches	3
Number of naloxone kits distributed	6
Number and percent of individuals currently incarcerated who screened positive for opioid use	7
Number and percent of individuals released from jail or prison with OUD who received a naloxone kit upon release	6
Number and percent of individuals formerly incarcerated who experienced a fatal overdose within 90 days following jail release	5
Number of prescribers with X-waiver	6
Percent of people with OUD in specialty treatment for OUD using medications for opioid use disorder (MOUD)	5,6
Number of syringe exchange programs/ syringe service programs (SSP)	6
Emerging trends in local drug supply	8
Number of people receiving opioid prescriptions	9

Overdose Indicators

Indicator	Percent of Population with Opioid Use Disorder (OUD)
Key Investigation Question	**7**
Stratification	Geography (county, zip code, or census tract)
	Demographics (age, race, ethnicity, and sex)
	Populations of focus (persons formerly incarcerated, on parole, or on probation; persons experiencing homelessness; persons who are pregnant or parenting)
Definition	Prevalence of OUD
Suggested Use	OUD can be used to understand prevention and treatment needs.
Reporting Frequency	Annually
Rationale or Why We Care about this Data	This is a basic population health measure and provides a general estimate of the burden of OUD.
Suggestions for Securing Data	If local universities have received a grant to perform a local assessment, consider partnering with them.
	Consider approaching local/regional managed care organizations or the State Medicaid Agency to request data for the number of individuals diagnosed with OUD.[2]
Possible Data Sources	There are models to estimate this based upon local population and the National Survey on Drug Use and Health (NSDUH)
	Data lag: Note that NSDUH is available annually but with a 1-year lag (ex: 2019 data is available in 2020)
	https://nsduhweb.rti.org/respweb/homepage.cfm
Data Owners	City and/or county health department
	State Medicaid Agency
	Medicaid managed care organization
Suggestions & Limitations in Interpreting this Data	It is often difficult to secure data to calculate prevalence in areas smaller than a state. Proxies such as Medicaid and other insurance populations can be used to identify claims with opioids or other substance use disorder diagnoses.
Examples and References	Treatment of Substance Use Disorders in Medicaid 2017 (see page 17) https://www.medicaid.gov/medicaid/data-and-systems/downloads/macbis/sud-data-book.pdf
	NSDUH Behavioral Health Barometers by State https://www.samhsa.gov/data/report/behavioral-health-barometer-state-barometers-volume-6

Indicator	Number and Rates of Fatal Overdose (potentially include suspected overdoses)			
Key Investigation Question	**1,2,4,5,7**			
Stratification	Geography (county, zip code, or census tract)			
	Demographics (age, race, ethnicity, and sex)			
	Populations of focus (persons formerly incarcerated, on parole, or on probation)			
	Circumstances around overdose deaths			
Definition	Number and population specific (i.e., crude) rates of overdose deaths			
	See: https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm for more information about provisional vs. confirmed overdose deaths			
	For this rate, we are suggesting crude rates (analysts decides to express per 1,000 or 100,000) in order to present rates by race, age and sex similar to the NY State dashboard referenced in the last row of the table.			
	Denominator or population information could be sourced through local government or US Census American Community Survey at https://data.census.gov/			
Suggested Use	Overdose death information can serve as a foundation for targeting interventions towards specific populations and geographical areas.			
Reporting Frequency	Quarterly, or as needed			
Rationale or Why We Care about this Data	This can indicate where either higher incidence or rates of overdose events are occurring and where there may be high impact potential for interventions. It might also indicate a potential worsening or improvement of the crisis during a designated time period. While unlikely to secure data over short durations of time (i.e., hours or days), if possible, this indicator can be used to identify the potential of overdose "spikes."			
Suggestions for Securing Data	Connect with city, county, or state health departments to determine if case-level overdose data is already being collected and shared. It may be possible to develop a relationship with local medical examiners or coroners and develop data sharing or data use agreements to secure regular access to this information. However, these offices may have limited capacity to respond to individual data requests so first check with the local or state health department.			
	Check whether your state participates in the State Unintentional Drug Overdose Reporting System (SUDORS)			
Possible Data Sources	Local: Medical Examiner or Coroner's Office			
	State: Department of Health, Vital Statistics Office; CDC's Overdose Data to Action (OD2A) program reports data from 47 states and the District of Columbia. If your state is included on this list, local hospitals are likely to have a collection and reporting system in place. https://www.cdc.gov/drugoverdose/od2a/index.html			
	State: SUDORS; if your state participates in SUDORS, it captures detailed information on toxicology, death scene investigations, route of administration, and other risk factors that may be associated with a fatal overdose			
	Federal: CDC WONDER, NCHS https://wonder.cdc.gov/ https://www.cdc.gov/nchs/			

Indicator	Number and Rates of Fatal Overdose (potentially include suspected overdoses)
Data Owners	Local Medical Examiner or Coroner's Office
	State Department of Health, Vital Statistics Office
Suggestions & Limitations in Interpreting this Data	Consider using suspected overdose and information and weigh the risks of potential inaccuracies against the value it offers for timeliness of death data. Additionally, consider strategies to eliminate double-counting suspected overdoses that become confirmed.
	Vital statistics include a standardized mortality reporting system that provides the most complete data on deaths in the United States. When a person dies in a suspicious, unusual, or unnatural way (such as accidental overdose), death certificates are typically completed by medical examiners and coroners at the local level. Data are maintained by state and local health departments and are collected by the National Vital Statistics System (NVSS). While vital statistics provide the most reliable information, it often takes state departments of health some time (often more than one year) to verify death certifications for a complete year. Therefore, information may be lagging for local public health purposes. Local medical examiners and coroners gather more information about these deaths than what is included in death certificates and often determine the causes of those deaths sooner than annual statewide death certifications are completed. As mentioned above, consider the purposes for the use of death data and whether timeliness or completeness is preferred.
	The comprehensiveness of post-mortem toxicology testing varies by jurisdiction. Understanding which toxicological tests are typically used can help shape the interpretation of results and highlight potential limitations. However, interpreting toxicology results may be difficult due to the relationship of parent drugs/substances to drug metabolites that may be present. Generally, limitations in toxicology testing may result in an underestimate in the number of deaths involving opioids.[3,4,5]
Examples and References	King County Overdose Deaths https://kingcounty.gov/depts/health/examiner/services/reports-data/overdose.aspx
	King County 2018 Overdose Death Report https://kingcounty.gov/depts/health/~/media/depts/health/medical-examiner/documents/2018-overdose-death-report.ashx
	Vital Signs: Characteristics of Drug Overdose Deaths https://www.cdc.gov/mmwr/volumes/69/wr/mm6935a1.htm
	New York State Opioid Overdose Dashboard https://webbi1.health.ny.gov/SASStoredProcess/guest?_program=/EBI/PHIG/apps/opioid_dashboard/op_dashboard&p=tbl&ind_id=op51

Indicator	Number of Syndromic Emergency Department (ED) Visits Related to Suspected Overdoses
Key Investigation Question	**3,4,5,7**
Stratification	Patient zip code
	Demographics (age, race, ethnicity, and sex)
	Drug class (opioids, heroin, stimulants)
Definition	Number of ED visits within local jurisdictions that meet state's definition of suspected overdose or CDC's National Syndromic Surveillance Program (NSSP) case definition of suspected "all drug overdose"
	To calculate a rate, analysts may use the number of ED visits related to suspected overdose as the numerator, and the total population in a given time period as the denominator. Analysts may decide to calculate this rate by patient geography. In this case, use the number of ED visits related to suspected overdose by patient zip code as the numerator and the population in that zip code as the denominator.
Suggested Use	Syndromic ED visit data can be used as an early warning system to alert communities to changes in the rate of overdoses and allows for timely and focused responses at the local level, including targeting of resources and dissemination of emergency health alerts.
Reporting Frequency	Monthly, or as needed
Rationale or Why We Care about this Data	Due to the rapid availability of this data, it serves as an early warning system to alert communities of changes.
	EDs can serve as a point of intervention for persons who experience an overdose by connecting patients with needed services (including case management services, peer navigators, and harm reduction services) and treatment, educating patients on prescription drug use, or enacting post-overdose protocols such as providing patients with naloxone.
Suggestions for Securing Data	Connect with city, county, or state health departments to determine if these data are being collected and/or reported.
Possible Data Sources	State department of health syndromic surveillance
	State: CDC's Drug Overdose Surveillance and Epidemiology (DOSE) System captures data from 47 states and the District of Columbia. If your state is included in this list, you may contact the state health department for additional detail on access.
	https://www.cdc.gov/drugoverdose/data/nonfatal/drugs-overall.html
Data Owners	State department of health
Suggestions & Limitations in Interpreting this Data	Overestimates or underestimates due to coding differences between hospitals, the availability of ICD-10-CM diagnostic codes, and the quality of chief complaint data need to be considered. Findings should be verified against other data sources when possible. Some state health departments suggest listing this indicator as a rate instead of a number due to these limitations and subsequent uncertainty of the estimate.
	Often, this data includes unique events, not unique persons, and might reflect multiple visits for one person.
	This data may likely be an underestimate of the actual prevalence of nonfatal drug overdoses because some people who overdose do not present to the ED.

Indicator	Number of Syndromic Emergency Department (ED) Visits Related to Suspected Overdoses
Examples and References	Vital Signs: Trends in Emergency Department Visits for Suspected Opioid Overdoses https://www.cdc.gov/mmwr/volumes/67/wr/mm6709e1.htm
	Ohio DOH https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/violence-injury-prevention-program/suspected-od-dashboard2
	Virginia DOH https://www.vdh.virginia.gov/surveillance-and-investigation/syndromic-surveillance/drug-overdose-surveillance/
	Prevent Overdose Rhode Island https://preventoverdoseri.org/ems-data/
	Georgia DOH https://dph.georgia.gov/drug-overdose-syndromic-surveillance-monthly-reports
	Pennsylvania PDMP Interactive Data Report https://www.health.pa.gov/topics/programs/PDMP/Pages/Data.aspx
	Vivolo-Kantor A, Pasalic E, Liu S Overdose Morbidity Team, et al. Defining indicators for drug overdose emergency department visits and hospitalisations in ICD-10-CM coded discharge data. Injury Prevention 2021;27:i56-i61.

Indicator	Number of Overdose- (or Drug-) Related Emergency Medical Service (EMS) Dispatches and/or 911 Calls
Key Investigation Question	2,3
Stratification	Geography (county, zip code, or census tract)
	Demographics (age, race, ethnicity, and sex)
	Transport vs. Refusal to transport
Definition	Number of overdose- or drug-related dispatches (can be a percent of all EMS dispatches)
Suggested Use	This can be used as an indicator of where, when, and among whom overdoses have occurred in a community.
Reporting Frequency	Weekly or monthly
Rationale or Why We Care about this Data	This is an indicator of 1) the worsening or improvement of the crisis during a designated time period, and 2) how first responders are engaged in preventing fatal overdoses.
	If available, transports to the hospital and the disposition of the individuals in emergency situations can also be reported to communicate the number of lives saved. This may assist in the development of more timely emergency response interventions.
Suggestions for Securing Data	Partner with local first responder agencies (fire department, police department, and EMS) or a local or state government agency that manages EMS.
	ODMAP (Overdose Detection Mapping Application Program) provides near real-time suspected overdose surveillance data for jurisdictions. Go to http://www.odmap.org/#agency to see if there is a participating agency in your jurisdiction.
Possible Data Sources	Municipal EMS, police, and fire departments
	Local state/health departments that may have an existing relationship with EMS agencies or other state agencies that have provided this data
Data Owners	Municipal EMS agencies
	Local or state health department
Suggestions & Limitations in Interpreting this Data	Not all drug-related EMS dispatches/911 calls will be related to opioid overdoses. However, they can be a good approximation of where, when, and among whom overdoses have occurred. Sometimes there is available disposition data or notes from the scene that may be useful for epidemiological or prevention purposes (i.e., person thought he/she was using cocaine but it was laced with fentanyl, person was arrested upon EMS arrival or after transport to the hospital, or naloxone was used as a way to rule-out an opioid overdose.)
	Certain demographics may not be included, such as race and ethnicity

Indicator	Number of Overdose- (or Drug-) Related Emergency Medical Service (EMS) Dispatches and/or 911 Calls
Examples and References	State of Indiana Next Level Recovery Dashboard https://www.in.gov/recovery/data/
	New Jersey Department of Health Naloxone Incidents https://www.state.nj.us/health/populationhealth/opioid/opioid_naloxone.shtml
	North Carolina Department of Health and Human Services https://www.ncdhhs.gov/opioid-and-substance-use-action-plan-data-dashboard
	Fix, Jonathan, Amy I. Ising, Scott K. Proescholdbell, Dennis M. Falls, Catherine S. Wolff, Antonio R. Fernandez, and Anna E. Waller. Linking emergency medical services and emergency department data to improve overdose surveillance in North Carolina. Public Health Reports 136, no. 1_suppl (2021): 54S–61S.
	Pesarsick, Jeffrey, Melody Gwilliam, Olayemi Adeniran, Toni Rudisill, Gordon Smith, and Brian Hendricks. Identifying high-risk areas for nonfatal opioid overdose: a spatial case-control study using EMS run data. Annals of epidemiology 36 (2019): 20–25.
	Rock, Peter J., Dana Quesinberry, Michael D. Singleton, and Svetla Slavova. Emergency medical services and syndromic surveillance: a comparison with traditional surveillance and effects on timeliness. Public Health Reports 136, no. 1_suppl (2021): 72S–79S.

Indicator	Number and Percent of Naloxone Administrations by First Responders During Overdose-Related Dispatches
Key Investigation Question	**3**
Stratification	Geography (county, zip code, or census tract)
	Demographics (age, race, ethnicity, and sex)
	Transport vs. Refusal to transport
Definition	Number and percent of overdose-related first responder dispatches where naloxone was administered
	We advise that the denominator used to calculate this percent would be the number of dispatches related to suspected overdoses. There are codes in EMS data to limit these.
Suggested Use	This can be used as an indicator of where, when, and among whom overdoses have occurred in a community.
Reporting Frequency	Weekly or monthly
Rationale or Why We Care about this Data	This is an indicator of 1) the worsening or improvement of the crisis during a designated time period, and 2) how first responders are engaged in preventing fatal overdoses.
	If available, transports to the hospital and the disposition of the individuals in emergency situations can also be reported to communicate the number of lives saved. This may assist in the development of more timely emergency response interventions.
Suggestions for Securing Data	Partners with local EMS agencies or a local or state government agency that manages EMS
	ODMAP (Overdose Detection Mapping Application Program) provides near real-time suspected overdose surveillance data for jurisdictions. Go to http://www.odmap.org/#agency to see if there is a participating agency in your jurisdiction.
Possible Data Sources	Municipal EMS agencies
	Local police and fire departments who administer naloxone as first responders
	Local state/health departments that may have an existing relationship with EMS agencies or other state agencies that have provided this data
Data Owners	Municipal EMS agencies
	Local police and/or fire departments
	Local or state health department

Basic Drug Use Epidemiology: A Guide

Indicator	Number and Percent of Naloxone Administrations by First Responders During Overdose-Related Dispatches
Suggestions & Limitations in Interpreting this Data	Not all naloxone administrations by first responders represent actual opioid overdoses. However, they can be a good approximation of where, when, and among whom overdoses have occurred. Sometimes there is available disposition data or notes from the scene that may be useful for epidemiological or prevention purposes (i.e., person thought he/she was using cocaine but it was laced with fentanyl, or person was arrested upon EMS arrival or after transport to the hospital.)
	Naloxone administered by laypersons, fire departments, law enforcement, EMS, and other first responders may not be captured in a single dataset. A review of local first responder naloxone administration protocols and related data collection policies may reveal gaps and considerations for interpretation.
	If multiple doses of naloxone are needed per single event, this may be used as an early indicator of high potency opioids, such as fentanyl, emerging in the local drug supply.
Examples and References	City of Cincinnati Overdose Heroin Response https://insights.cincinnati-oh.gov/stories/s/Heroin/dm3s-ep3u/
	Ray, Bradley R., Evan M. Lowder, Aaron J. Kivisto, Peter Phalen, and Harold Gil. EMS naloxone administration as non-fatal opioid overdose surveillance: 6-year outcomes in Marion County, Indiana. Addiction 113, no. 12 (2018): 2271-2279.

Indicator	Number of Naloxone Kits Distributed
Key Investigation Question	**6**
Stratification	Geography (county, zip code, or census tract)
	Distribution type (community event, first responder, jail, treatment facility, etc.)
	Recipient demographics (age, race, ethnicity, sex, and specific population group)
Definition	Number of naloxone kits distributed by geography and by recipient (entity or individual, if possible)
Suggested Use	Knowing where and to whom naloxone has been distributed can guide priorities for future naloxone distribution efforts to ensure that areas and populations that experience higher incidence or rate of overdoses are targeted for naloxone distribution.
Reporting Frequency	Quarterly
Rationale or Why We Care about this Data	Naloxone can be distributed universally, or it can be targeted to ensure that regions that are most affected by overdoses receive priority consideration in distribution efforts. Calculating where naloxone should be distributed based on either geographic or population-specific need as measured by opioid-related events can either guide intervention planning efforts or be used to evaluate whether previous naloxone distribution was targeted.
Suggestions for Securing Data	Partner with local syringe service programs, health care providers, pharmacies, insurers, and health departments.
Possible Data Sources	State offices such as departments of health that purchase and distribute naloxone using grant funds
	Syringe service programs are also a good source and are usually the early adopters in a community for this overdose prevention activity
Data Owners	Local or state health department
Suggestions & Limitations in Interpreting this Data	While this can indicate government and other groups' distribution of naloxone, because the kits are not tracked, it is difficult to know who receives naloxone and whether groups in communities that are experiencing higher rate of overdoses are using naloxone distributed in their areas or networks.

Indicator	Number of Naloxone Kits Distributed
Examples and References	Idaho Office of Drug Policy https://prevention.odp.idaho.gov/wp-content/uploads/2020/11/NaloxoneMiniGrant_OutcomesReportFY20.pdf
	Indiana Department of Health Naloxone Distribution Program https://www.in.gov/health/overdose-prevention/naloxone/naloxone-distribution-program/
	Tracking Community Naloxone Distribution (NYC) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6606159/
	Zang, Xiao, Alexandria Macmadu, Maxwell S. Krieger, Czarina N. Behrends, Traci C. Green, Jake R. Morgan, Sean M. Murphy et al. "Targeting community-based naloxone distribution using opioid overdose death rates: A descriptive analysis of naloxone rescue kits and opioid overdose deaths in Massachusetts and Rhode Island." International Journal of Drug Policy 98 (2021): 103435.
	B.H. Lambdin, R.N. Bluthenthal, L.D. Wenger, E. Wheeler, B. Garner, P. Lakosky, A.H. Kral, et al. Overdose Education and Naloxone Distribution Within Syringe Service Programs—United States, 2019 Morbidity and Mortality Weekly Report, 69 (2020), p. 1117

Indicator	Number and Percent of Individuals Currently Incarcerated who Screened Positive for Opioid Use
Key Investigation Question	**7**
Stratification	Facility
	Drug Type
	Demographics (age, race, ethnicity, and sex)
Definition	Number and percent of individuals currently incarcerated who screened positive for opioid use, drug use, and/or OUD
Suggested Use	Positive drug screens among individuals currently incarcerated in jails can be used to estimate the need for treatment in jails, as a surveillance tool for emerging drugs in the community, and as a denominator for interventions delivered within jails.
Reporting Frequency	Quarterly, or as needed
Rationale or Why We Care about this Data	Individuals are at much higher risk of fatal overdoses in the weeks and months following jail release.[6,7] Understanding the population at risk may help jurisdictions determine which treatment or prevention services offered during incarceration or during release planning are most effective to preventing fatal overdoses.
Suggestions for Securing Data	Partner with local public health agencies or correctional facilities to secure this data.
Possible Data Sources	Local jail healthcare provider or health department overseeing correctional healthcare
Data Owners	Local jail healthcare provider or health department overseeing correctional healthcare
Suggestions & Limitations in Interpreting this Data	Ensure that the screening procedures in the jail include the use of validated screens or some other formal protocol.
Examples and References	NIDA 2017, December 14 Treating Opioid Addiction in Criminal Justice Settings https://www.drugabuse.gov/publications/treating-opioid-addiction-in-criminal-justice-settings
	Howell, Benjamin A., Rosemarie A. Martin, Rebecca Lebeau, Ashley Q. Truong, Emily A. Wang, Josiah D. Rich, and Jennifer G. Clarke. Changes In Health Services Use After Receipt Of Medications For Opioid Use Disorder In A Statewide Correctional System. Health Affairs 40, no. 8 (2021): 1304–1311.
	Brinkley-Rubinstein, Lauren, Nickolas Zaller, Sarah Martino, David H. Cloud, Erin McCauley, Andrew Heise, and David Seal. Criminal justice continuum for opioid users at risk of overdose. Addictive behaviors 86 (2018): 104–110.

Indicator	Number and Percent of Individuals Released from Jail with Opioid Use Disorder (OUD) who Received a Naloxone Kit upon Release
Key Investigation Question	6
Stratification	Jail Facility
	Prior housing status and housing status upon release
	Demographics (age, race, ethnicity, and sex)
Definition	Number and percent of individuals released from incarceration during a specified time period who screened positive for OUD at booking and/or while incarcerated and received a naloxone kit upon release
Suggested Use	Distributing naloxone kits to individuals with OUD upon release is one overdose prevention strategy. Examining the number and percent of individuals who received these kits can help evaluate the impact of naloxone distribution efforts and broader prevention efforts among the criminal justice-involved population.
Reporting Frequency	Quarterly
Rationale or Why We Care about this Data	This indicator helps us understand the effectiveness of naloxone distribution as an overdose prevention effort among those released from jail. The number of kits distributed can highlight potential operational challenges in the distribution process.
Suggestions for Securing Data	Partner with local jails to determine if they have a naloxone distribution policy or program for individuals upon release. If so, identify which entity is responsible for implementing this program and what data is currently being collected. For example, is this program operated by the correctional institution; a city, county, or state government healthcare provider; or another organization.
Possible Data Sources	Organization overseeing naloxone distribution program within correctional facility. This may be the local jail or state department of corrections.
Data Owners	Organization overseeing naloxone distribution program within correctional facility. This may be the local jail or state department of corrections.
Suggestions & Limitations in Interpreting this Data	Consider the program's criteria for offering naloxone to patients upon release.
Examples and References	Overdose Education and Naloxone Distribution in the San Francisco County Jail https://www.liebertpub.com/doi/10.1177/1078345819882771
	Showalter, David, Lynn D. Wenger, Barrot H. Lambdin, Eliza Wheeler, Ingrid Binswanger, and Alex H. Kral. "Bridging institutional logics: Implementing naloxone distribution for people exiting jail in three California counties." Social Science & Medicine 285 (2021): 114293.

Indicator	Number and Percent of Individuals Formerly Incarcerated Who Experienced a Fatal Overdose Within 90 Days Following Jail Release
Key Investigation Question	**5**
Stratification	Geography (county, zip code, or census tract)
	Facility (if there are multiple in the local area)
	Use of medications (Y/N) to treat opioid use disorder during and/or following release; Distribution of naloxone upon release (Y/N)
	Demographics (age, race, ethnicity, current housing status, and sex)
Definition	Number and percent of individuals released from jail within the past 90 days who experienced a fatal overdose
Suggested Use	This can be used as an indicator of the jurisdiction's overall efforts to prevent overdoses among a disproportionately affected population (those formerly incarcerated) when the risk of relapse and overdose is the highest (first 90 days).[8,9]
Reporting Frequency	Quarterly
Rationale or Why We Care about this Data	This is an indicator of the worsening or improvement of overdose prevention efforts among a high-risk population during a critical time period. Increasing rates of fatal overdose following jail release may be an indicator of service gaps, access barriers, and ineffective or insufficient community treatment options. Assessing current overdose prevention strategies may help identify and inform policy recommendations, improvements to care coordination, and needed interventions.
	Gaining a deeper understanding of the characteristics of decedents and the circumstances surrounding these fatalities may also help jurisdictions identify specific risk factors for this population within the local context.
Suggestions for Securing Data	Connect with city, county, or state health departments to determine if case-level overdose data is already being collected and shared. It may be possible to develop a relationship with local medical examiners or coroners and develop data sharing or data use agreements to secure regular access to this information. However, these offices may have limited capacity to respond to individual data requests so first check with the local or state health department. Once case-level overdose fatality data is secured, partner with the local corrections institution to assess different approaches to matching decedent cases to release records in their database.
Possible Data Sources	Fatal overdose data may be secured from the coroner or medical examiner's office
	City/county jail release data may be secured from the local correctional institution
	These datasets may be matched to determine which cases of fatal overdoses observed within the specified time period were of individuals released from jail or prison within the past 90 days.
Data Owners	Local coroner or medical examiner's office
	Local jail or correctional facility

Basic Drug Use Epidemiology: A Guide

Indicator	Number and Percent of Individuals Formerly Incarcerated Who Experienced a Fatal Overdose Within 90 Days Following Jail Release
Suggestions & Limitations in Interpreting this Data	Use this data to identify opportunities for prioritized interventions. For example, a jail with a higher incidence or rate of fatal overdose following release may be the result of a failure to offer treatment medications or naloxone. Consider comparing rates by individuals who were incarcerated who did or did not utilize medications for opioid use disorder (MOUD).
	Consider other timeframes to calculate overdoses. A large portion of overdoses occur in the first weeks following jail release.
Examples and References	Opioid-related overdose deaths in Allegheny County: 2015–2016 Update https://www.alleghenycountyanalytics.us/wp-content/uploads/2018/08/17-ACDHS-22_Opioid_Overdose_082018.pdf
	Risk of Overdose Death Following Release from Prison or Jail https://health.maryland.gov/vsa/Documents/Overdose/Briefs/corrections%20brief_V3.pdf

Indicator	Number of Prescribers with X-Waiver (to prescribe buprenorphine)
Key Investigation Question	**6**
Stratification	Geography (county, zip code, or census tract)
Definition	Number of waivered prescribers by geographical location
Suggested Use	The location of waivered prescribers can be used to indicate or develop measures of treatment accessibility throughout a region or state.
Reporting Frequency	Annually
Rationale or Why We Care about this Data	Buprenorphine is considered to be a gold standard of treatment for opioid use disorder[10] yet it has been underutilized for a variety of reasons including accessibility.[11,12]
Suggestions for Securing Data	SAMHSA buprenorphine practitioner locator contains only those prescribers who agreed to list their practice address during the waiver training: https://www.samhsa.gov/medication-assisted-treatment/find-treatment/treatment-practitioner-locator?field_bup_state_value=56
	Often, the state's Prescription Drug Monitoring Program (PDMP) or licensing body will have a more complete list, including those who are prescribing this medication.
	The United States Drug Enforcement Administration (DEA) may also be a source for complete lists of waivered prescribers.
Possible Data Sources	Use the SAMHSA Practitioner Locator: https://www.samhsa.gov/medication-assisted-treatment/find-treatment/treatment-practitioner-locator?field_bup_state_value=56
	Contact your state PDMP office. This page lists the leads and contact information for each state: https://www.pdmpassist.org/State
	DEA
Data Owners	State Department of Health, PDMP
Suggestions & Limitations in Interpreting this Data	Use this data to map locations of prescribers. Completing this as a rate of the surrounding population (such as county population) can help to identify areas with a lower concentration of providers. This can be used to identify a need for more prescribers in less populated or rural areas and even demonstrate the need for telemedicine options for buprenorphine. Consider distinguishing between those who are prescribing this medication from those who are just waivered to prescribe. [Note HHS change to waiver requirement Jan 2021]
Examples and References	Trends in Buprenorphine Treatment in the United States, 2009–2018 https://jamanetwork.com/journals/jama/fullarticle/2758992
	Rowe, Christopher L., Jennifer Ahern, Alan Hubbard, and Phillip O. Coffin. "Evaluating buprenorphine prescribing and opioid-related health outcomes following the expansion the buprenorphine waiver program." Journal of Substance Abuse Treatment 132 (2022): 108452.

Indicator	Percent of People with Opioid Use Disorder (OUD) in Treatment for OUD Using Medications for Opioid Use Disorder (MOUD)
Key Investigation Question	**5,6**
Stratification	Facility
	Demographics (age, race, ethnicity, and sex)
Definition	Number and percent of people in specialty treatment for OUD who visited an opioid treatment program (OTP) or filled a prescription for buprenorphine during treatment episode
Suggested Use	Knowing who has utilized MOUD can be an indicator of the effectiveness of treatment interventions.
Reporting Frequency	Annually
Rationale or Why We Care about this Data	Buprenorphine is considered to be a gold standard of treatment for OUD,[13] yet it has been underutilized for a variety of reasons including availability or knowledge of the effectiveness of this treatment option by local rehabilitation or substance use disorder (SUD) treatment providers.[14,15] While a lot of state and federal resources have been invested towards increasing access to treatment, the gold standard treatment is often not provided.[16] Utilization of buprenorphine is an indicator of the potential effectiveness of the public investment in treatment for OUD.
Suggestions for Securing Data	Partner with regional managed care organizations OR state/local government departments that are responsible for managing publicly funded SUD treatment including Medicaid and Substance Abuse Prevention and Treatment Block Grant (SAPT-BG) program funds.
Possible Data Sources	Usually, managed care records are the most comprehensive source of this information, especially Medicaid, which often pays for the majority of treatment for OUD.
Data Owners	Single State Authority (often within a department of health or human services)
	State Medicaid Agency
Suggestions & Limitations in Interpreting this Data	While Medicaid often pays for the lion's share of treatment, increases in federal grants to state and local organizations to increase access to treatment can make it challenging to understand the true rate of medication utilization. However, Medicaid data are often adequate to understand to what extent effective treatment is being delivered, which group(s) are receiving something approximating effective care, and whether limited tax dollars are being utilized effectively.
	The SAPT-BG program funds can be used to pay for methadone maintenance treatment and buprenorphine prescription for uninsured populations but data accessibility and quality may present challenges
	Accessing behavioral health data may be more challenging in some jurisdictions due to data suppression policies and practices
Examples and References	Mississippi State Department of Health, Buprenorphine Prescriptions 2012–2018 https://msdh.ms.gov/msdhsite/_static/resources/8387.pdf

Indicator	Number of Syringe Exchange Programs/Syringe Service Programs (SSP)
Key Investigation Question	**6**
Stratification	Geography (county, zip code, or census tract)
Definition	Number of operating syringe exchange programs within local jurisdiction (consider range of services provided)
Suggested Use	SSPs can serve as a point of intervention for persons at risk for overdose who may be harder to reach through other types of programs.
Reporting Frequency	Quarterly, or as needed
Rationale or Why We Care about this Data	This can indicate if services are available in geographic areas that are experiencing a high number of overdoses or infections related to injection drug use. As a related indicator, consider monitoring the rate of blood-borne infections associated with injection drug use, such as Hepatitis B, Hepatitis C, HIV, and bacteria that cause heart infections (endocarditis).
	SSPs can provide a range of services including access to and disposal of sterile syringes, vaccination, testing, naloxone distribution, wound care, education, and linkages to care. SSPs can also play an important role in reducing the transmission of infections such as viral hepatitis and HIV.
Suggestions for Securing Data	Connect with city, county, or state health departments to determine what data is being collected.
	Contacting each SSP in your jurisdiction may be beneficial to increasing knowledge of program services, concerns, and current evaluation efforts.
Possible Data Sources	North American Syringe Exchange Network (NASEN). This directory may not be comprehensive as it only includes programs that are NASEN members or have given NASEN permission to publish their information. https://www.nasen.org/map/
	State health departments or State health authorities may maintain a SSP directory for your state. For examples, see: Washington State and Oregon Health Authority (https://www.doh.wa.gov/YouandYourFamily/DrugUserHealth/SyringeServicePrograms/Directory) and Oregon Health Authority (https://www.oregon.gov/oha/PH/DISEASESCONDITIONS/HIVSTDVIRALHEPATITIS/HIVPREVENTION/Pages/ssp.aspx)
	Consider partnering with a local researcher who may be focused on evaluating local SSP programs.
Data Owners	State or local departments of health
	SSPs
Suggestions & Limitations in Interpreting this Data	SSPs are not available in certain states due to legal barriers.[17,18] Many programs operating in authorized states may be underfunded – thereby limiting the types of services available. If available, consider reporting the number of participants in each program. This can be compared with information about the population in need of these critical services.
Examples and References	Summary of Information on the Safety and Effectiveness of SSPs https://www.cdc.gov/ssp/syringe-services-programs-summary.html
	Measures of harm reduction service provision for people who inject drugs https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6705510/

Indicator	Emerging trends in the local drug supply
Key Investigation Question	**8**
Stratification	Geography (county, zip code, or census tract)
	Drug type (class or category)
Definition	Percent change in the quantity of drug type seized
	Presence of drugs by type in urine screen results
	Presence of drugs by type in wastewater
	Test results of drug products
Suggested Use	Emerging drug trends can serve as an indicator of the presence of drugs that can inform intervention strategies.
Reporting Frequency	Quarterly, or as needed
Rationale or Why We Care about this Data	This can indicate the presence and prevalence of emerging drugs to inform the appropriate intervention approach.
Suggestions for Securing Data	Consider connecting with local jails which may screen inmates upon booking.
	Consider partnering with drug epidemiologists for a local university, research institution, or health department who may be interested in exploring innovative ways to examine emerging drug tends (i.e., wastewater analysis). Note that some of these approaches may take specially targeted resources.
Possible Data Sources	State and/or local law enforcement
	Regional High Intensity Drug Trafficking Area (HIDTA)
	Forensic laboratories
	Drug screening results from local correctional facilities
	NDEWS (for participating jurisdictions) https://ndews.org/
Data Owners	State law enforcement
	Regional HIDTA
	The United States Drug Enforcement Administration (DEA)
	Local jail
Suggestions & Limitations in Interpreting this Data	Drug seizure data may not be accessible in certain states due to legal barriers. Information may be restricted if seizure data are being used in active investigations.
	Drug screening results from correctional facilities may be able to only test for specific substance types due to the screening methods used (urinalysis is most common and only select drugs can be identified in urine.) Also consider what processes are used to determine who is being screened. In some facilities, only those who are pregnant or appear to be intoxicated at booking are screened.

Basic Drug Use Epidemiology: A Guide

Indicator	Emerging trends in the local drug supply
Examples and References	NETI Emerging Threats Report 2018 https://www.hidtaprogram.org/emergingthreats.php
	Working Upstream: How Far Can You Go with Sewage-Based Drug Epidemiology? https://pubs.acs.org/doi/full/10.1021/es4044648?src=recsys&
	Urine Drug Screen Trends https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6424508/
	Wright, Austin P., Christopher M. Jones, Duen Horng Chau, R. Matthew Gladden, and Steven A. Sumner. "Detection of emerging drugs involved in overdose via diachronic word embeddings of substances discussed on social media." Journal of Biomedical Informatics 119 (2021): 103824.

Indicator	Number of People Receiving Opioid Prescriptions
Key Investigation Question	**9**
Stratification	Geography (county, zip code, or census tract)
	Demographics (age, race, ethnicity, and sex)
	Type of medication (opioid analgesics vs treatment medications, i.e., methadone, buprenorphine)
Definition	Number of people who filled a prescription for an opioid, whether to treat pain or an opioid use disorder
Suggested Use	Opioid prescription fill data, including the number of people who are receiving a high daily dose of opioids (measured in morphine milligram equivalent, or MME) or have multiple provider visits within a specified time period, can help to identify key populations that may benefit from patient safety education, naloxone, or education about the risks associated with discontinuing buprenorphine.
	Consider monitoring overlapping opioid prescriptions with stimulant and benzodiazepine prescriptions, particularly from multiple prescribers. Overlapping prescriptions have been identified as a strong risk factor for overdose.
Reporting Frequency	Quarterly
Rationale or Why We Care about this Data	This can indicate patients who may be at risk from an overdose by virtue of receiving an opioid medication especially if they were not co-prescribed naloxone.[19,20] Additionally, this may indicate populations who may be at risk of returning to use and overdosing following the discontinuation of treatment with buprenorphine.
Suggestions for Securing Data	Connect with state Prescription Drug Monitoring Program (PDMP) office
Possible Data Sources	PDMP Training and Technical Assistance Center (PDMP TTAC) https://www.pdmpassist.org/State
Data Owners	State department of health, PDMP
Suggestions & Limitations in Interpreting this Data	Consider using this data to calculate the number of patients in a geographic area who filled a prescription for buprenorphine through a pharmacy or comparing the number of physicians who are prescribing buprenorphine against the number of physicians who hold an X-waiver. [Note: HHS change to waiver requirement Jan 2021]
	If allowed by state and local law, consider relating PDMP with other datasets such as State Unintentional Drug Overdose Reporting System (SUDORS), EMS, or ED data to better understand the association between local prescribing practices and opioid-related harms.
Examples and References	Centers for Medicare and Medicaid Services (CMS) Opioid Prescribing Mapping Tools https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/OpioidMap
	Washington State Department of Health Opioid Prescription Dashboard https://www.doh.wa.gov/DataandStatisticalReports/WashingtonTrackingNetworkWTN/Opioids/CountyPrescriptionsDashboard

Additional Resources

Council of State and Territorial Epidemiologists. Overdose Surveillance Technical Assistance Data Linkage Webinar Series. https://www.cste.org/general/custom.asp?page=overdose-course

Purington, K. & Manz, J. How States Access and Deploy Data to Improve SUD Prevention, Treatment, and Recovery. The National Academy for State Health Policy. https://www.nashp.org/how-states-access-and-deploy-data-to-improve-sud-prevention-treatment-and-recovery/#toggle-id-

ChangeLab Solutions. Leveraging Data Sharing for Overdose Prevention. 2020. https://www.changelabsolutions.org/sites/default/files/2020-07/LeveragingDataSharingforOverdosePrevention_accessible_FINAL_20200707.pdf

National Association of City and County Health Officials. Opioid Epidemic Toolkit 2021. https://www.naccho.org/programs/community-health/injury-and-violence/opioid-epidemic/local-health-departments-and-the-opioid-epidemic-a-toolkit

Endnotes

[1] Marc R. Larochelle, Svetla Slavova, Elisabeth D. Root, Daniel J. Feaster, Patrick J. Ward, Sabrina C. Selk, Charles Knott, Jennifer Villani, and Jeffrey H. Samet, 2021: Disparities in Opioid Overdose Death Trends by Race/Ethnicity, 2018–2019, From the HEALing Communities Study. American Journal of Public Health 111, 1851_1854, https://doi.org/10.2105/AJPH.2021.306431

[2] Hospital Inpatient Stays Related to Opioid Use Disorder and Endocarditis, 2016 (2020). Agency for Healthcare Research and Quality, Statistical Brief #256. https://www.hcup-us.ahrq.gov/reports/statbriefs/sb256-Opioids-Endocarditis-Inpatient-Stays-2016.jsp

[3] Concheiro, Marta, Rachel Chesser, Justine Pardi, and Gail Cooper. "Postmortem toxicology of new synthetic opioids." Frontiers in pharmacology 9 (2018): 1210.

[4] O'Donnell, Julie K., John Halpin, Christine L. Mattson, Bruce A. Goldberger, and R. Matthew Gladden. "Deaths involving fentanyl, fentanyl analogs, and U-47700—10 states, July–December 2016." MMWR. Morbidity and mortality weekly report 66, no. 43 (2017): 1197.

[5] Chesser, Rachel, Justine Pardi, Marta Concheiro, and Gail Cooper. "Distribution of synthetic opioids in postmortem blood, vitreous humor and brain." Forensic science international 305 (2019): 109999.

[6] Binswanger IA, Blatchford PJ, Lindsay RG, Stern MF. Risk factors for all-cause, overdose, and early deaths after release from prison in Washington State. Drug Alcohol Depend. 2011;117(1):1–6.

[7] Ranapurwala SI, Shanahan ME, Alexandridis AA, Proescholdbell SK, Naumann RB, Edwards Det al. Opioid overdose mortality among former North Carolina inmates: 2000–2015. Am J Public Health. 2018;108(9):1207–13. Crossref, Medline

[8] Ranapurwala SI, Shanahan ME, Alexandridis AA, Proescholdbell SK, Naumann RB, Edwards Det al. Opioid overdose mortality among former North Carolina inmates: 2000–2015. Am J Public Health. 2018;108(9):1207–13. Crossref, Medline

[9] Bukten, Anne, Marianne Riksheim Stavseth, Svetlana Skurtveit, Aage Tverdal, John Strang, and Thomas Clausen. "High risk of overdose death following release from prison: variations in mortality during a 15-year observation period." Addiction 112, no. 8 (2017): 1432–1439.

[10] Ajazi, Elizabeth M., Nabarun Dasgupta, Stephen W. Marshall, Jane Monaco, Annie Green Howard, John S. Preisser, and Todd A. Schwartz. "Revisiting the X: BOT Naltrexone Clinical Trial Using a Comprehensive Survival Analysis." Journal of Addiction Medicine (2021).

[11] Saloner B, Karthikeyan S. Changes in Substance Abuse Treatment Use Among Individuals With Opioid Use Disorders in the United States, 2004-2013. JAMA. 2015;314(14):1515–1517. doi:10.1001/jama.2015.10345

[12] McCausland, C. Extending Their Reach: UMSOM Addiction Experts Use Innovative Approaches to Help Remote Areas of the State. University of Maryland, Baltimore. Catalyst Magazine Fall 2021 (Volume 3 Issue 2). https://catalystmag.umaryland.edu/extending-their-reach-umsom-addiction-experts-use-innovative-approaches-to-help-far-flung-parts-of-the-state/

[13] Ajazi, Elizabeth M., Nabarun Dasgupta, Stephen W. Marshall, Jane Monaco, Annie Green Howard, John S. Preisser, and Todd A. Schwartz. "Revisiting the X: BOT Naltrexone Clinical Trial Using a Comprehensive Survival Analysis." Journal of Addiction Medicine (2021).

[14] Andrilla, C. Holly A., and Davis G. Patterson. "Tracking the geographic distribution and growth of clinicians with a DEA waiver to prescribe buprenorphine to treat opioid use disorder." The Journal of Rural Health (2021).

[15] Duncan, Alexandra, Jared Anderman, Travis Deseran, Ian Reynolds, and Bradley D. Stein. "Monthly patient volumes of buprenorphine-waivered clinicians in the US." JAMA network open 3, no. 8 (2020): e2014045–e2014045.

[16] Saloner B, Karthikeyan S. Changes in Substance Abuse Treatment Use Among Individuals With Opioid Use Disorders in the United States, 2004–2013. JAMA. 2015;314(14):1515–1517. doi:10.1001/jama.2015.10345

[17] Centers for Disease Control and Prevention. Syringe Services Programs FAQs. https://www.cdc.gov/ssp/syringe-services-programs-faq.html

[18] Fernández-Viña, Marcelo H., Nadya E. Prood, Adam Herpolsheimer, Joshua Waimberg, and Scott Burris. "State laws governing syringe services programs and participant syringe possession, 2014-2019." Public Health Reports 135, no. 1_suppl (2020): 128S–137S.

[19] Stein, Bradley D., Rosanna Smart, Christopher M. Jones, Flora Sheng, David Powell, and Mark Sorbero. "Individual and Community Factors Associated with Naloxone Co-prescribing Among Long-term Opioid Patients: a Retrospective Analysis." Journal of General Internal Medicine (2021): 1–6.

[20] National Institute on Drug Abuse. Policy Brief Naloxone for Opioid Overdose: Life Saving Science. https://www.drugabuse.gov/publications/naloxone-opioid-overdose-life-saving-science