**Undetermined risk factors for fentanyl-related overdose deaths — Ohio, 2015 (EpiAid 2016-003)**
***Trip Report – Epi2***


Erica Spies, Phd, MS
EIS Officer
Division of Violence Prevention/NCIPC/CDC

Alexis Peterson, PhD
EIS Officer
Division of Unintentional Injury Prevention and Division of Analysis, Research and Practice Integration/NCIPC/CDC

Amanda Garcia-Williams, Phd, MPH
EIS Officer
Division of Violence Prevention/NCIPC/CDC

John Halpin, MD, MPH
Medical Officer
Division of Unintentional Injury Prevention/NCIPC/CDC

Matt Gladden, PhD
Behavioral Scientist
Division of Unintentional Injury Prevention/NCIPC/CDC

Jon Zibbell, PhD
Behavioral Scientist
Division of Unintentional Injury Prevention/NCIPC/CDC

Carolyn Lullo McCarty, PhD
EIS Officer Assigned to the Ohio Department of Health
Division of Scientific Education and Professional Development/CSELS/CDC

*National Center for Injury Prevention and Control*
*Centers for Disease Control and Prevention (CDC)*

**Table of Contents**

## Executive Summary

Fentanyl, a medication most commonly prescribed for advanced cancer pain management, is a rapidly acting and highly potent synthetic opioid which is 50-100 times more potent than morphine. In early 2015, the Drug Enforcement Administration (DEA) noted that an illicitly-produced version of fentanyl, commonly mixed with heroin or cocaine, had become a threat to public safety and was implicated in a growing number of unintentional overdose fatalities around the country. In October, 2015, the Ohio Department of Health (ODH) reported that 502 fentanyl-related unintentional overdose deaths had occurred in Ohio in 2014, a 500% increase from 2013, with fentanyl-related deaths accounting for 20% of all drug poisoning deaths that year, a substantial increase compared with 4% in 2013. Preliminary data indicated that the number of fentanyl-related deaths was continuing to increase in Ohio in 2015.

The Ohio Department of Health has launched a comprehensive response to the increase in fentanyl-related deaths. A broad overview of these activities can be found on the Ohio Mental Health and Addiction services website at http://mha.ohio.gov/Portals/0/assets/Initiatives/GCOAT/Opiate-Strategy-Next-Steps.pdf. As part of their public health response, the Ohio Department of Health requested CDC's assistance in an epidemiologic investigation (EpiAid) to examine the ongoing increase in unintentional fentanyl-related overdose deaths in their state, elucidate the population most at risk, and inform their public health response. On October 26, 2015, Epidemic Intelligence Service (EIS) Officers Drs. Erica Spies, Alexis Peterson, and Amanda Garcia-Williams, and staff scientists John Halpin, Matt Gladden, and Jon Zibbell, deployed to Columbus, Ohio, and in conjunction with ODH officials, conducted a three-week investigation which included visits to four regional hotspots of the epidemic (Hamilton, Cuyahoga, Scioto, and Montgomery Counties). The investigative team was joined on November 13th, 2015 by Carolyn McCarty, the EIS Officer in Ohio, who participated in data analysis and report review.

The field investigation consisted of the collection of a wide range of quantitative and qualitative data, including death certificates, coroner and medical examiner reports, toxicology reports, emergency department visit data, emergency medical services data, and prescription histories from the Ohio Automated Rx Reporting System (OARRS), Ohio's prescription drug monitoring program (PDMP). To better identify and understand circumstances associated with fentanyl-related overdose, detailed data on decedent drug history, medical history, and scene characteristics were abstracted from Coroner and Medical Examiner reports and entered into Ohio's National Violent Death Reporting System (NVDRS), where it was linked with existing Vital Statistics data. Data was abstracted for all opioid overdose deaths occurring between January 1, 2014 and December 31, 2014 in the 14 highest burden counties for fentanyl-related mortality. The counties chosen consisted of a mixture of urban and rural counties, and included Butler, Clark, Clermont, Cuyahoga, Fayette, Hamilton, Lucas, Miami, Montgomery, Ross, Scioto, Stark, Summit, and Warren counties. For comparative purposes, cases were grouped into three major categories: fentanyl-related fatal overdose, heroin-related (exclusive of fentanyl) fatal overdose, and prescription opioid-related fatal overdose (exclusive of heroin and fentanyl).

In addition to intensive data extraction and analyses, members of the EpiAid team conducted regional and state-level key stakeholder meetings with representatives from public health, medical examiners and coroners, law enforcement, harm reduction programs, emergency medical services, emergency departments, addiction services, and health commissioners. The purpose of these meetings was to gather stakeholder perspectives on key circumstances contributing to Ohio's increase in fentanyl-

related overdose deaths, as well as to identify major areas of concern related to the public health response to this epidemic.

*Major Findings*

The majority of the population experiencing fentanyl-related unintentional overdose deaths were male (69%), white (89%), never married (55%), and had some college or less education (94%). The average age of fentanyl decedents was 37.9 years old, with ages ranging from 17 to 71 years old. Although large metropolitan counties (population >1 million) had a higher number and percentage of all fentanyl-related deaths (47%), moderate metropolitan counties (population 250k to 1 million) had the highest rate of fentanyl-related deaths (6.63 per 100,000). Risk factors for fentanyl-related overdose deaths included: male gender, white race, some college or less education, history of substance abuse problem, and current mental health problem (e.g., depression, anxiety, or bipolar disorder). Additional risk factors included: recent release from an institution within the last month (e.g. jail, hospital, and treatment facility), and a history of high-dose opioid prescription (>=90 morphine milligram equivalents). The sharp increase in fentanyl-related deaths in Ohio appeared to closely coincide with a similar sharp increase in the confiscation of illicitly-produced fentanyl by law enforcement in Ohio, based on state-specific data obtained from the DEA.

The population experiencing fentanyl-related overdose deaths did not vary greatly from the population experiencing heroin-related (exclusive of fentanyl) deaths on various socio-demographic characteristics. Approximately 62% of all fentanyl and heroin decedents had a record of at least one opioid prescription from a healthcare provider during the seven years preceding their death, and 1 in 10 heroin decedents, and 1 in 5 fentanyl decedents, had an opioid medication prescribed to them at the time of their death. Further analysis of Ohio PDMP (OARRS) data revealed that substantial percentages of fentanyl and heroin decedents (40% and 33% respectively) had been prescribed an opioid at high doses (>=90 morphine milligram equivalents) at some point in the seven years preceding death. Further analysis will be needed to determine the duration and timing of these high dose opioid prescriptions.

*Recommendations*

Recommendations from this EpiAid focus on enhancing public health surveillance for fentanyl morbidity and mortality, targeting of public health response to high-burden counties and high-risk groups, enhancing and facilitating response to fentanyl-related overdoses by EMS and laypersons, and improving access to naloxone and addiction services. The findings and recommendations can be utilized in the development of public health messaging by the Ohio Department of Health.

Key recommendations include:

-Support for continued testing for fentanyl by coroners and medical examiners, especially in suspected opioid-related overdoses.

-Continue monitoring of fentanyl-related overdose deaths in counties with high opioid overdose burden, as well as in counties with a combination of high heroin-related mortality and low rate of fentanyl-related mortality.

-Targeting interventions in the 8 high burden counties that accounted for approximately 2 out of 3 fentanyl-related overdoses in 2014, as well as those suburban and rural counties where the rate of fentanyl-related overdose are highest.

-Targeting interventions to address risk factors that are most prevalent in each county. For instance, one county was found to have a particularly high rate of fentanyl-related overdose deaths among persons recently released from an institution.

-Working with public health agencies to help ensure the availability and widespread use of Naloxone by all EMS responders, particularly in counties hardest hit by the current epidemic.

-Ensuring first responders are aware of the high potency and rapid onset of fentanyl, and the likely need for multiple naloxone administrations to achieve resuscitation.

-Improving overdose recognition among laypersons, and highlighting the importance of alerting EMS even when naloxone has been administered.

-Consider means for expanded access and use of naloxone to community members and first responders when feasible, including potential liability protections for community people administering naloxone

-Ensure people have access to integrated prevention services, including access to sterile injection equipment from a reliable source, as allowed by local policy.

-Additional recommendations include improvement of prescribing practices for opioid pain relievers paired with referral of patients abusing opioids for addiction services, and public education to reduce stigma of substance abuse and its treatment.

-Preliminary data indicates the need to conduct additional investigation of the opioid prescription history of people dying in heroin and fentanyl-related overdoses to identify concerning prescription patterns (e.g., doctor shopping) associated with these overdose decedents.

-Because a significant percent of people dying from fentanyl and heroin-related overdoses had previously been prescribed opioid pain relievers, more work is needed to identify high risk prescribing patterns associated with types of overdoses and identify opportunities for early intervention.

## 1.0 Background of the Field Investigation

Fentanyl, a synthetic, short-acting opioid analgesic, is 50–100 times more potent than morphine and is approved for the management of severe or chronic pain, typically among opioid-tolerant patients.(1) Although pharmaceutical fentanyl (legally manufactured) can be diverted for abuse, most cases of fentanyl-related morbidity and mortality reported to the U.S. Drug Enforcement Administration (DEA) since 2014 have been linked to illicitly manufactured (non-pharmaceutical) fentanyl and fentanyl analogs. (2, 3) In March, 2015, the DEA issued a nationwide alert for fentanyl as a threat to health and public safety. (4) This alert was followed by a DEA National Heroin Threat Assessment Summary, which noted that, "Beginning in late 2013, and throughout 2014, several states have reported spikes in overdose deaths due to fentanyl and its analog acetyl-fentanyl."(5) In September, 2015, the Ohio Department of Health (ODH)released an alert warning Ohio residents of the dramatic rise in fentanyl-related overdose deaths that had occurred in 2014 compared to the previous year (see http://www.medscape.com/viewarticle/851502), and noted the various public health response activities that were planned in response. In October 2015, the Centers for Disease Control and Prevention (CDC) issued a national health advisory to alert public health and medical practitioners of possible increases in fentanyl-related overdose fatalities in several regions around the country. (See http://emergency.cdc.gov/han/han00384.asp)

Although there exists significantly less information about illicit fentanyl abuse relative to other opioids, clusters of illicit fentanyl-related deaths have been detected in the past decade and have been noted in the scientific literature. Using surveillance data in five locations (New Jersey, Maryland, Chicago, Detroit, and Philadelphia), a report published by the CDC in 2007, in conjunction with the DEA, identified 1,013 deaths due to illicit fentanyl use between April 4, 2005 and March 28, 2007.(6) Other studies analyzing patterns of illicit fentanyl use during this time period were published which focused on specific states or counties.(8, 9) In early 2013, northern Rhode Island experienced a cluster of 12 overdose deaths associated with acetyl fentanyl – an illegally produced fentanyl analog.(10) While the small number of cases limited the scope of the analyses, the investigation detected a clear increase in deaths due to illicit drug use as a result of the introduction of this fentanyl-like compound. The following year, an investigation of an increase in fentanyl-related overdose deaths in Rhode Island from November 2013 through March 2014 found that twice as many all-intent drug overdose deaths were reported during this period than had been historically reported. (11) Most drug overdose deaths were among injection drug users, and a large proportion of drug overdoses involved fentanyl. However, approaches to targeting fentanyl users and the development of tailored interventions have not yet been elucidated.

In November, 2015, a report from ODH indicated that 502 fentanyl-related unintentional overdose deaths had occurred in 2014, based on data current at the time of release. (12) This represented a 500% increase from the 84 fentanyl-related unintentional overdose deaths that had been reported in Ohio in 2013. The report further indicated that fentanyl-related unintentional overdose deaths in 2014 had accounted for 20% of all drug poisoning deaths in the state that year, compared with 4% in 2013. Identifying the circumstances and risk factors that are contributing to this increase in deaths is critical to implementing strategies that will prevent additional deaths.

## 2.0 EpiAid Purpose and Objectives

In the fall of 2015, ODH requested CDC's assistance in an ongoing investigation to investigate the epidemic of fentanyl-related overdose deaths in their state. The request cited their intention to better understand the population most at risk, and inform their public health response. The field epidemiologic investigation, or EpiAid, represented one of a wide range of activities across Ohio state government in response to the opiate crisis in Ohio. A comprehensive overview of these activities can be found on the Ohio Mental Health and Addiction services website at http://mha.ohio.gov/Portals/0/assets/Initiatives/GCOAT/Opiate-Strategy-Next-Steps.pdf. In response to the state's request, six members of an EpiAid Team were deployed to the state to investigate, including Epidemic Intelligence Service (EIS) Officers Drs. Erica Spies, Amanda Garcia-Williams, and Alexis Peterson, and staff scientists Drs. John Halpin, Matt Gladden, and Jon Zibbell. The team deployed to Columbus, Ohio on October 26, 2015 and were present through November 12, 2015. The team was joined by Carolyn McCarty, EIS Officer assigned to Ohio, on November 13.

The main objectives of this emergency public health response were to:

1. Characterize the population experiencing fentanyl-related overdose deaths, and compare it with the population experiencing heroin-related and prescription opioid overdose deaths.

2. Identify key risk factors for fentanyl-related overdose deaths that can be targeted by prevention activities.

3. Provide epidemiologic and qualitative information that can aid the Ohio Department of Health in developing their public health response, including public health messaging and recommendations to health professionals, law enforcement, and populations at risk.

4. Assist in the identification of strategies to help the Ohio Department of Health monitor and prevent future fentanyl-related overdose deaths.

## 3.0 Methods Used in the Field

CDC collaborated with ODH for this emergency public health response. Statewide analyses were conducted on death certificate information, emergency department visit data, and emergency medical services data. In order to better identify and understand the circumstances associated with fentanyl-related overdoses, more in-depth data on opioid overdose fatalities were obtained. This data consisted of coroner and medical examiner reports from 14 high burden counties for fentanyl-related overdose in the state of Ohio during 2014, and included toxicology data from these reports. The counties chosen consisted of a mixture of urban and rural counties, and included Butler, Clark, Clermont, Cuyahoga, Fayette, Hamilton, Lucas, Miami, Montgomery, Ross, Scioto, Stark, Summit, and Warren counties.

### 3.1 *Vital statistics*

An epi-curve of all fentanyl-related fatalities, and the relationship between fentanyl and heroin-related fatal overdoses was examined at the state and county level. Analyses looking at the relationship between fentanyl and heroin were limited to unintentional drug overdose. Inclusion of deaths occurring five months subsequent to the January 1, 2014 to December 31, 2014 study period were added to gain insight into the most recent data on fentanyl-related deaths. Death certificate information after May 2015 was still being collected at the time of the study and thus was not appropriate for inclusion in the analysis. An epidemic curve was created to describe the trend of fentanyl-related unintentional overdose deaths by month during January 1, 2014-May 31, 2015. Frequencies and proportions were calculated for all socio-demographic variables.

Fentanyl-related unintentional overdose decedents were identified within death certificate data using the following criteria:

1) Cause of death listed as fentanyl overdose, poisoning, or intoxication. This case definition was implemented by conducting a text search for the term "fentanyl". Unfortunately, the *International Classification of Disease, Tenth Revision* (ICD-10) coding scheme does not allow for the identification of fentanyl-related deaths.
2) Manner of death listed as "Unintentional Injury", "Could not be determined", or "P" (i.e., pending)[1].
3) Death occurred during January 1, 2014-May 31, 2015.
4) Resident state of decedent listed as Ohio.

Heroin-related unintentional overdoses[2] were defined using the following criteria:

1) Cause of death listed as heroin overdose, poisoning, or intoxication. This case definition was implemented using two criteria.
    a. First, deaths with a manner of "Unintentional Injury" that also contained the term "heroin" in one of the cause of death fields were classified heroin overdoses.
    b. Second, a death was also classified a heroin overdose if the (ICD-10) underlying cause of death was coded X40-X44 (i.e., unintentional drug overdose) AND any multiple cause-of-death code was coded T40.1, or heroin.[3]
2) Death occurred during January 1, 2014-May 31, 2015.
3) Resident state of decedent listed as Ohio.

Numbers and rates of deaths in this report may vary slightly from previously published results because vital statistics information is continually being updated and revised as more information becomes available and reported to authorities. Analyses of the number and rate of fentanyl-related deaths relied on data extracted during November 2015.

---

[1] 982 of the 998 identified fentanyl-related cases had an unintentional manner of death. Of the remaining 16, 11 had a pending or could not be determined manner of death. The remaining 5 cases were classified as natural, but review of the records indicated fentanyl intoxication or overdose contributed to the death.

[2] A more restrictive definition of heroin overdose that only captured unintentional overdoses was used in order to improve the specificity of the measure. Also, only a small number of heroin deaths had an undetermined manner.

[3] ICD-10 information was not available for many overdose deaths that occurred in 2015. When ICD-10 and text information were both available, they were strongly related. For instance, in 2014, the text search identified 97% of the cases identified by the ICD-10 coding and only identify a small number of additional cases not identified by the ICD-10 code (i.e., 42 of 1265).

### *3.2 National Violent Death Reporting System*

CDC reviewed and included for analysis all coroner/medical examiner-reviewed drug overdose deaths that occurred between January 1, 2014 and December 31, 2014 that occurred in the 14 counties of interest in Ohio. The primary purpose of these analyses was to compare the characteristics of fentanyl-related drug overdose deaths with heroin and prescription opioid deaths. Consequently, cases were grouped into three major categories: fentanyl-related fatal overdoses, heroin-related (exclusive of fentanyl) fatal overdoses, and prescription opioid overdose (exclusive of heroin and fentanyl) fatal overdoses. Detailed operational definitions for each category are provided below.

*Fentanyl-related drug overdose death (Fentanyl):* A fentanyl-related case was defined as a person who died within one of the 14 Ohio counties, from January 1—December 31, 2014, and whose cause of death was determined to be a drug overdose in which fentanyl – alone or in combination with other substances – played a role, as confirmed by a positive immunoassay screen with a pending gas chromatography/ mass spectrometry (GC/MS) test for fentanyl or nor-fentanyl (metabolite). All routes of administration for fentanyl were included in this case definition.

*Heroin overdose death (Heroin*): A Heroin control was defined as a person who died within one of the 14 identified Ohio counties, during January 1—December 31, 2014, and whose cause of death was determined to be a drug overdose in which heroin – alone or in combination with other substances but excluding fentanyl – played a role, as confirmed by a positive immunoassay screen and GC/MS test for morphine and the presence of 6-monoacetylmorphine (6-MAM, a heroin metabolite).

*Prescription opioid-related overdose death (Prescription Opioid):* A prescription opioid control was defined as a person who died within one of the 14 identified Ohio counties, during January 1—December 31, 2014, and whose cause of death was determined to be a drug overdose in which prescription opioids – alone or in combination with other substances, excluding fentanyl and heroin – played a role, as confirmed by a positive immunoassay screen and/or GC/MS test for morphine or codeine and any of the following: oxycodone, hydrocodone, oxymorphone, hydromorphone, and methadone presence on toxicology screen.

***3.2.1 Data analyses:*** Descriptive analyses were conducted for all fentanyl cases, heroin controls, and prescription opioid controls. Frequencies and proportions were calculated for select socio-demographic, medical, drug use, death scene, and toxicology variables. (See full list of abstracted variables in Appendix 2) Analyses were conducted to distinguish the fentanyl cases from the controls. Bivariate comparisons were made between fentanyl cases and non-fentanyl controls utilizing cross-tabulations and Chi-square analyses. Findings were considered statistically significant if $p<0.05$.

***3.2.2 Information management and analysis software*:** Coroner/medical examiner data was entered into the National Violent Death Reporting System (NVDRS). Analytic SAS version 9.0 files created from NVDRS downloads were saved on a CDC secure password protected server. All database, syntax and output files are password protected and stored in CDC's secure server. Only the CDC EpiAid team researchers have access to the electronic data files.

### *3.3 Ohio Automated Rx Reporting System*

The Ohio Automated Rx Reporting System (OARRS) is Ohio's prescription drug monitoring program that was established in 2006 to address the growing issue of misuse and diversion of prescription drugs. Data on prescription history from 2007-2014 was made available to the EpiAid team. OARRS can be used for many purposes including patient care, drug epidemic early warning system, and drug diversion and insurance fraud investigative tool. For this investigation, analyses focused on linking OARRS data with death certificate data in 2014. See Appendix 3 for a listing of all OARRS variables which were available for analysis.

### *3.4 Emergency Medical Services Data*

Emergency medical services (EMS) personnel can reverse opioid overdoses by administering naloxone to patients. Naloxone is used to reverse opioid overdoses caused by both prescription opioids and illicit opioids such as heroin. Reported naloxone administrations by EMS from January 2014 to June 2015 were reviewed to determine the extent to which naloxone administration could be used to track changes in opioid overdose rates and fentanyl overdoses. The high potency of fentanyl may require EMS to administer multiple EMS dosages to a patient experiencing an overdoses related to fentanyl. Thus, percent of naloxone administrations requiring multiple administrations was explored as a proxy for fentanyl overdoses. Data after June 2015 were still being collected as of the Epi-Aid.

Because EMS staff has incomplete information when determining whether to administer naloxone (e.g., person unconscious due to a suspected overdose or alcohol intoxication), some patients who did not overdose on an opioid will be administered naloxone (i.e., false positive) and some patients who experienced an opioid overdose will not get naloxone (i.e., false negative).

### *3.5 Syndromic Emergency Department (ED) Information*

To rapidly detect threats to public health and maintain situational awareness, Ohio systematically collects de-identified information on ED visits in near real-time. CDC and the Ohio Department of Health collaborated to determine if text searches of the chief complaint can be used to identify ED visits related to suspected drug, prescription opioid, and heroin-related overdoses. Data from over 18 million emergency department visits occurring from January 2013 to October 2015 were reviewed. The chief complaint captures the impression of the patient, emergency medical services staff, and other people accompanying the patient such as family as they enter the emergency department. Information from the patient or emergency medical services such as response to naloxone may be used to identify that the patient was experiencing an overdose related to heroin. The text algorithms that searched the chief complaint for words indicating heroin (e.g., heroin, herion) and overdose (e.g., OD, O.D, intoxication) were validated by comparing trends in emergency-department suspected drug, prescription opioid, and heroin-related overdoses to trends in fatal drug, opioid, and heroin-related deaths. The SAS code used to conduct the text search and the results of the quality analysis will be shared with Ohio in another document.

This analysis of ED data focused on reporting the results for heroin-related emergency department visits, as opposed to fentanyl-related emergency department visits, because fentanyl is unlikely to be

specified in the chief complaint, yet is commonly mixed with heroin. Because hospitals participating in the system slightly changed over time, hospitals were only included in the analyses if they had at least 10 ED visits per month during the time period of an analysis. From 2013 to 2014, 179 hospitals reported 10 or more ED visits per month and these hospitals accounted for 96% of ED visits identified as suspected drug overdoses in Ohio during this time. From 2014 to October 2015, 182 hospitals reported 10 or more ED visits per month and these hospitals accounted for 96% of ED visits identified as suspected drug overdoses in Ohio during this time.[4]

### *3.6 National Forensic Laboratory Information System (NFLIS)*

The National Forensic Laboratory Information System (NFLIS) is a program of the Drug Enforcement Administration (DEA), Office of Diversion Control that collects results on over 91% of non-controlled and controlled substances secured in law enforcement operations across the country and submitted to State and local forensic laboratories. In addition to data from DEA and the U.S. Customs and Border Protection (CBP) laboratories, NFLIS currently collects information from 50 state systems and 101 local or municipal laboratories/laboratory systems, representing a total of 278 individual laboratories.[5] This EpiAid explored whether changes in reported fentanyl drug-seizure rates can be used to estimate trends in fentanyl-related mortality. Fentanyl-related seizure rate information is available at the state level approximately every six months.

### *3.7 Ohio Substance Abuse Monitoring Network*

The Ohio Substance Abuse Monitoring Network is a program located in the Ohio Department of Mental Health and Addiction Services which collects qualitative and quantitative information on drug abuse from around the entire state. The network consists of eight regional epidemiologists located in the following regions: Akron-Canton, Athens, Cincinnati, Cleveland, Columbus, Dayton, Toledo, and Youngstown. Qualitative data are collected by various modalities, including focus groups and individual qualitative interviews with individuals who are actively using drugs or who are in recovery and community professionals (treatment providers, law enforcement officials, etc.). Quantitative data are obtained from various sources, including coroners' reports and crime laboratory data. The data are used to produce epidemiological descriptions of local substance abuse trends. Regular reports are produced and distributed every 6 months, and include data from all regions of the state. Special reports are also occasionally produced, known as "OSAM-o-Grams", for specific topics of concern. These reports are available to the public via the website of the Ohio Department of Mental Health and Addiction Services, and were reviewed by the EpiAid team, in particular a report focused on fentanyl-adulterated heroin released in September, 2015[3].

### *3.8 Qualitative Methods – Key Stakeholder Meetings*

Between October 26 and November 6, the Ohio Department of Health (ODH), in coordination with local partners, organized regional and state-level meetings with CDC and key stakeholders. Three state-

[4] Analyses were also run on heroin-related overdoses detected by all hospitals. Trends and findings were nearly identical to those reported on the restricted sample.

[5] https://www.nflis.deadiversion.usdoj.gov/Reports.aspx

[3] http://mha.ohio.gov/Portals/0/assets/Research/OSAM-TRI/092015-OSAMogram-heroin-fentanyl-update.pdf

level meetings occurred at ODH's offices in Columbus and four regional meetings occurred on site in Cuyahoga, Hamilton, Montgomery and Scioto Counties. Local partners identified and invited all meeting participants. Regional stakeholders included representatives from drug treatment, public health, law enforcement (federal, state and local), harm reduction programs (including overdose prevention programs [Project DAWN]), Emergency Medical Services (EMS), Emergency Departments, medical examiners and coroners, and Health Commissioners.

Two CDC scientists facilitated meetings using subject matter guides as prompts. The guides focused on eliciting the role that each stakeholder played in the response to the fentanyl epidemic, key perceived etiologic factors leading to the rise in fentanyl fatalities, key perceived characteristics of fentanyl users and OD decedents which placed them at risk for fentanyl OD, and key perceived challenges they faced in their response to the epidemic. Notes were generated by hand and meetings were audio-recorded to certify accuracy. Participant statements were reviewed separately by two CDC scientists and systematically assigned codes based on themes presented; coding schemes were compared ex post facto to ensure inter-coder reliability. Themes were derived from coded narratives and commonalities across the four regions were pile-sorted under specific thematic categories. Finally, thematic categories were organized into a common-sense framework to communicate findings effectively and narrative descriptions were abridged for clarity.

## 4.0 Results

Below are initial findings from this public health emergency response investigation. Data analyses are still ongoing, so ***findings should be considered preliminary and subject to change***. Findings are organized by data source. A summary of key findings organized by objective is provided in the section 5.0.

### *4.1 Vital Statistics*

The analyses of vital statistics had three purposes:

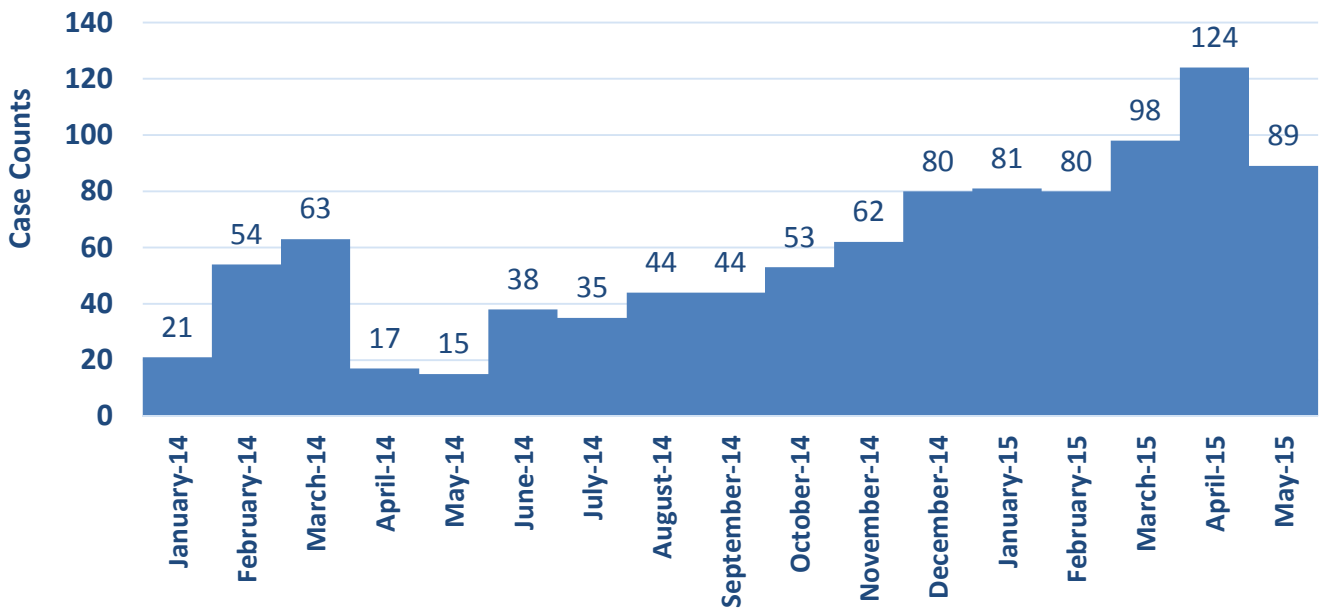
1) Track and describe the number of fatal overdoses related to fentanyl in Ohio, state-wide, during 2014 and 2015
2) Examine the extent to which heroin and fentanyl-related overdose deaths overlap and are associated
3) Describe and compare fatal overdoses related to fentanyl in the 14 study counties (i.e., counties where in-depth investigation of coroner and medical examiner records were performed) to the rest of Ohio to assess similarities and differences.

***4.1.1 Track and describe the sharp increase in fentanyl-related deaths in Ohio*:** During 2014 and the first 5 months of 2015, there were a total of 998 fentanyl-related deaths among Ohio residents 10 years of age or older (Figure 1). This total is most likely underestimated to some degree given that a significant percentage (11.6%) of drug overdose death certificates in Ohio in 2014 did not identify the specific drug(s) contributing to the overdose.[6] As depicted in an epicurve during January, 2014-May

[6] See http://www.cdc.gov/nchs/data/health_policy/unspecified_drugs_by_state_2013-2014.pdf

2015 (see Figure 1), the fentanyl-related overdose deaths in Ohio underwent a sharp temporary spike during the first five months of 2014, before beginning a steady rise in May, 2014, which continued through the end of the study period in mid-2015. The sharp spike in early 2014 is likely driven by fluctuations in the supply of illicit fentanyl in Ohio, as evidenced by a very similar spike in fentanyl confiscations by law enforcement in Ohio during this same period (see figure 8). The apparent drop in fentanyl-related overdose deaths observed in May 2015 is most likely an artifact due to incomplete data at the time of this analysis, based on the known time lag in reporting of deaths.

**Figure 1. Ohio State Resident Fentanyl-Related Unintentional Overdose Deaths by Month, January 2014-May 2015**




Decedents had the following socio-demographic characteristics (See Table 1):

- Mean age of decedents was 38 years with a range of 17 to 92 years
- 85% of decedents were between the ages of 18 and 54 years
- Majority of decedents:
    - Male (69%),
    - White (89%),
    - Never married (55%), and
    - Had some college or less education (94%)

**Table 1: Demographic characteristics of fentanyl-related unintentional overdose deaths, January 2014-May-2015.**

| Characteristic | N (%) |
|---|---|
| Mean Age (Years) 38 (Range: 17-92) | |
| Sex | |
| Female | 306 (31) |
| Male | 692 (69) |
| Race | |
| White | 890 (89) |
| Black | 94 (9) |
| Other | 14 (2) |
| Marital Status | |
| Never Married | 545 (55) |
| Married | 180 (18) |
| Divorced/separated | 235 (23) |
| Widowed | 27 (3) |
| Not Classifiable | 11 (1) |
| Education | |
| Less than High School | 224 (22) |
| High School Graduate/GED | 518 (52) |
| Some College | 199 (20) |
| College Graduate | 30 (3) |
| Post College Degree | 7 (1) |
| Unknown | 20 (2) |

In 2014, residents in 60 of Ohio's 88 counties experienced at least one fentanyl-related overdose death. Of these 60 counties, 8 counties reported 16 or more deaths, 11 counties reported 6 to 15 deaths, and 41 counties reported 1 to 5 deaths. In the first five months of 2015, 53 of Ohio's 88 counties have already experienced a fentanyl-related death, with 8 counties reporting 16 or more deaths. The vast majority of fentanyl-related deaths occurred to people living in large metropolitan areas (n=246, 47%) or moderately-sized metropolitan areas (n=200, 38%, See Table 2). The highest rate of fentanyl-related deaths however occurred in moderately-sized metropolitan areas (6.6 per 100,000 people). Small urban populations (<20,000 people) adjacent to metropolitan areas experienced fentanyl-related overdose rates similar to large metropolitan areas. Two out of three of all fentanyl-related deaths occurred in 8 large and moderate sized metropolitan counties (see Appendix 1 for full listing), and 4 moderately sized metropolitan counties had death rates ranging from 2.6 to 13.1 people

per 100,000 people. Future analyses are needed to investigate the physical location of the overdose deaths in addition to the residency of the decedent.

**Table 2: Number and Rate of Fentanyl-Related Deaths by Urban/Rural County Classification: 2014**

| Type of County | # of Counties in Ohio | % of Ohio's Population | Fentanyl Deaths 2014 | % of all Fentanyl Deaths | Rate of Fentanyl Deaths per 100,000 |
|---|---|---|---|---|---|
| Large metropolitan (> 1 million) | 20 | 49.2% | 246 | 46.8% | 4.31 |
| Moderate metropolitan (250k to 1 million) | 13 | 26.0% | 200 | 38.0% | 6.63 |
| Small metropolitan (< 250k) | 5 | 4.3% | 12 | 2.3% | * |
| Urban population, adjacent to metro (>20k) | 22 | 13.0% | 34 | 6.5% | 2.26 |
| Urban population, adjacent to metro (2,500 to 19,999) | 20 | 5.7% | 31 | 5.9% | 4.70 |
| All Other | 8 | 1.8% | ^ | ^ | ^ |

*Rate not reported because estimate would be unreliable because fewer than 20 deaths occurred in this type of county.
^Fewer than 10 deaths occurred in these types of counties. As a result, data was suppressed to protect confidentiality.

***4.1.2 Heroin and fentanyl-related deaths[7]*:** The increase in fentanyl-related deaths in Ohio is primarily linked to the mixing of illicit fentanyl with heroin, which is then sold as heroin, or illicit fentanyl sold alone, but typically marketed as heroin. As a result, the increases in fentanyl-related deaths need to be understood in the context of the growing morbidity and mortality related to heroin. Within Ohio, in 2014, heroin was involved in nearly half of all fatal drug overdoses, or 1,230 deaths. The number of heroin overdoses also substantially increased from 2013 and into early 2015. Specifically, heroin deaths gradually grew from around 250 deaths per quarter in 2013 to over 300 deaths per quarter from July 2014 to March 2015 (See Figure 2). A portion of this increase may involve the mixing of heroin with fentanyl. The percentage of heroin-related deaths that also involved fentanyl consistently increased from 2013 to the first quarter of 2015. Specifically, the percent of heroin-related deaths involving fentanyl increased from two percent in 2013 to 14 percent in 2014. In the first quarter of 2015, over 31 percent of heroin-related deaths involved fentanyl, or 95 out of 306 heroin-related deaths (See Figure 3).

[7] These analyses used a different version of the vital statistics file than the fentanyl-related death analysis and captured slightly fewer fentanyl-related deaths then the earlier section.

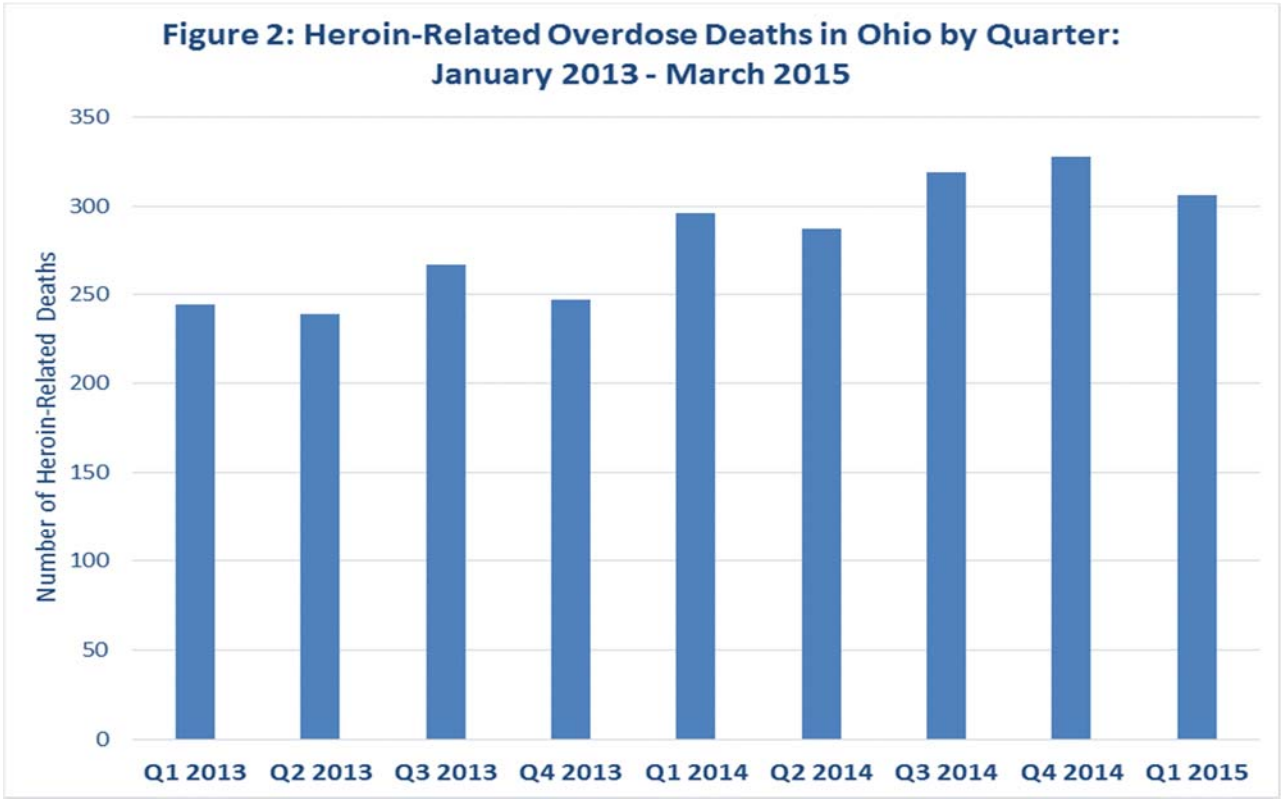


Figure 2: Heroin-Related Overdose Deaths in Ohio by Quarter: January 2013 - March 2015
Number of Heroin-Related Deaths
350
300
250
200
150
100
50
0
Q1 2013
Q2 2013
Q3 2013
Q4 2013
Q1 2014
Q2 2014
Q3 2014
Q4 2014
Q1 2015

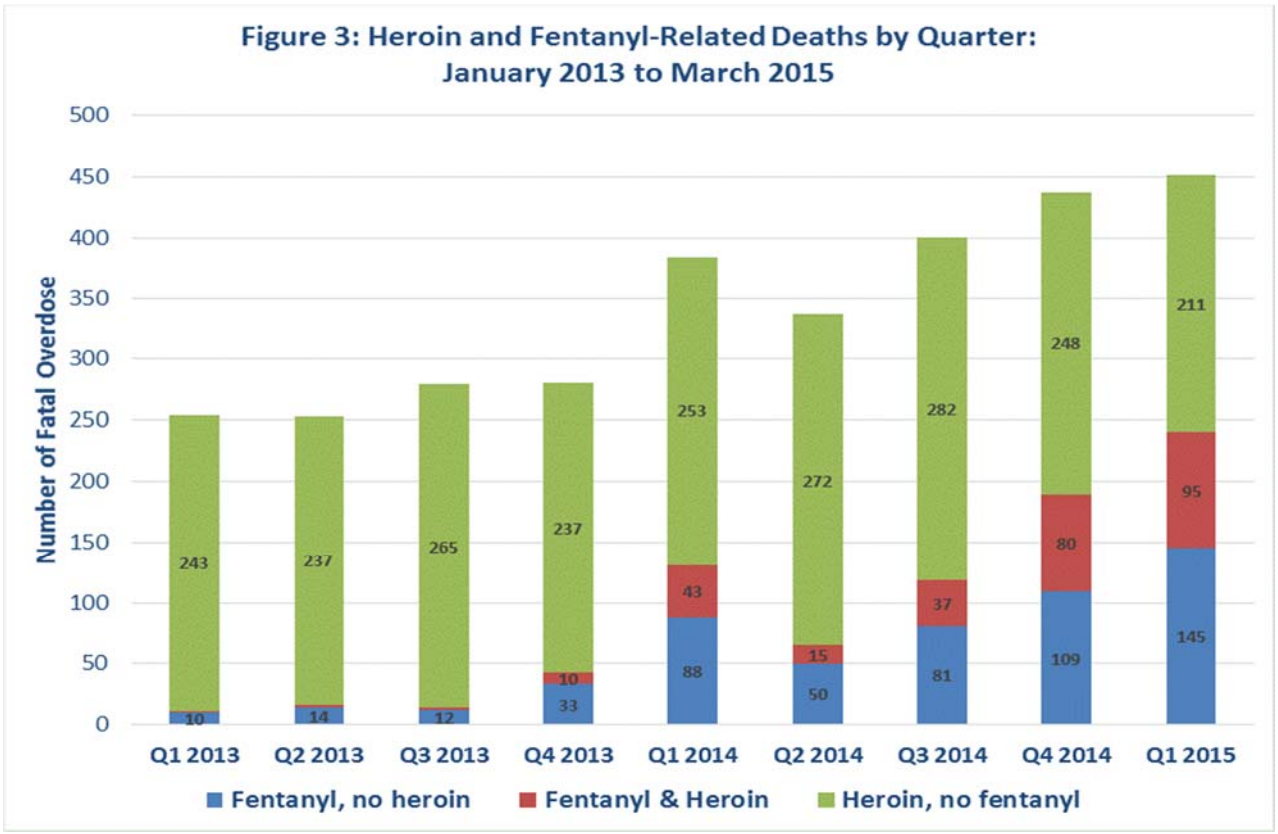
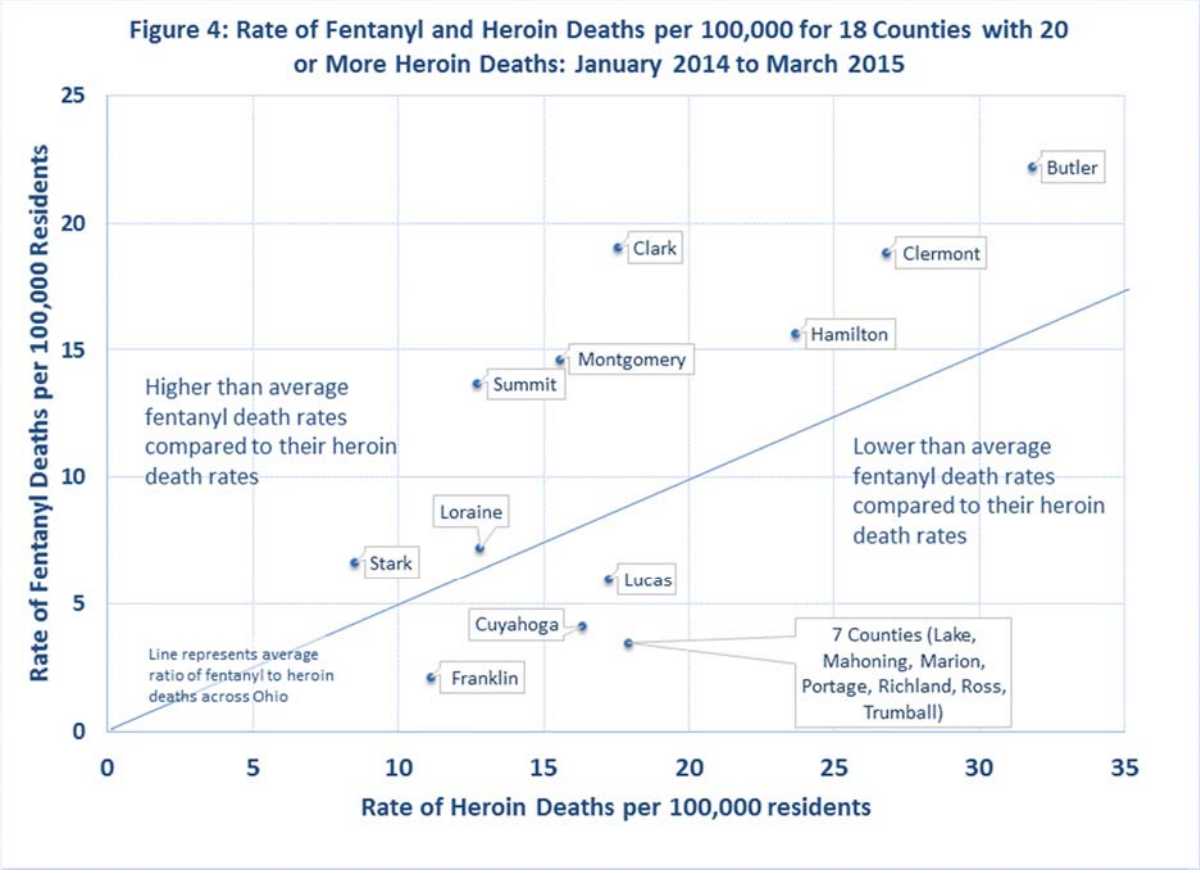


Figure 3: Heroin and Fentanyl-Related Deaths by Quarter: January 2013 to March 2015
Number of Fatal Overdose
500
450
400
350
300
250
200
150
100
50
0
243
237
265
237
253
272
282
248
211
10
14
12
33
10
88
43
50
15
81
37
109
80
145
95
Q1 2013
Q2 2013
Q3 2013
Q4 2013
Q1 2014
Q2 2014
Q3 2014
Q4 2014
Q1 2015
Fentanyl, no heroin
Fentanyl & Heroin
Heroin, no fentanyl

Because illicitly produced fentanyl often is mixed or marketed as heroin, heroin morbidity and mortality may act as a proxy for counties that are experiencing, or are vulnerable to experiencing, fentanyl-related deaths. To better understand the extent to which heroin and fentanyl overdose deaths were occurring concomitantly within counties, an analysis of fentanyl deaths in the 18 counties that experienced 20 or more heroin deaths from January 2014 to March 2015 was conducted. The analyses were limited to these counties so stable rate estimates of heroin overdose could be calculated. These 18 counties accounted for 80% and 83% of heroin and fentanyl deaths, respectively. The rates of heroin and fentanyl-related deaths during January 2014 to March 2015 were compared across these 18 counties (See Figure 4). In order to get reliable estimates, data from 7 counties with fewer than 20 fentanyl deaths per county during January 2014 and March 2015 were collapsed into a single category. Overall, the heroin death rate in these 18 counties was twice their fentanyl death rate, (16.8 per 100,000 for heroin versus 8.4 per 100,000 for fentanyl). This ratio, however, varied substantially by county. Three counties (Clark, Summit, and Montgomery) reported similar death rates for heroin and fentanyl while other counties reported heroin death rates that were four or more times greater than fentanyl death rates (Cuyahoga, Franklin, and combined data from the following 7 counties-Lake, Mahoning, Marion, Portage, Richland, Ross, or Trumball) (See Figure 4). Understanding why some counties had much lower fentanyl death rates compared to their heroin rates is important because it could indicate less use or supply of fentanyl in those counties, under-reporting of fentanyl-related deaths, or successful interventions.



In 2014, the distribution of heroin-related deaths was more concentrated in large metropolitan areas than fentanyl-related deaths. 56% of heroin-related deaths occurred in large metropolitan areas compared to 47% of fentanyl-related deaths (See Table 3).

**Table 3: Number and Rate of Fentanyl and Heroin-Related Deaths by Urban/Rural County# Classification: 2014**

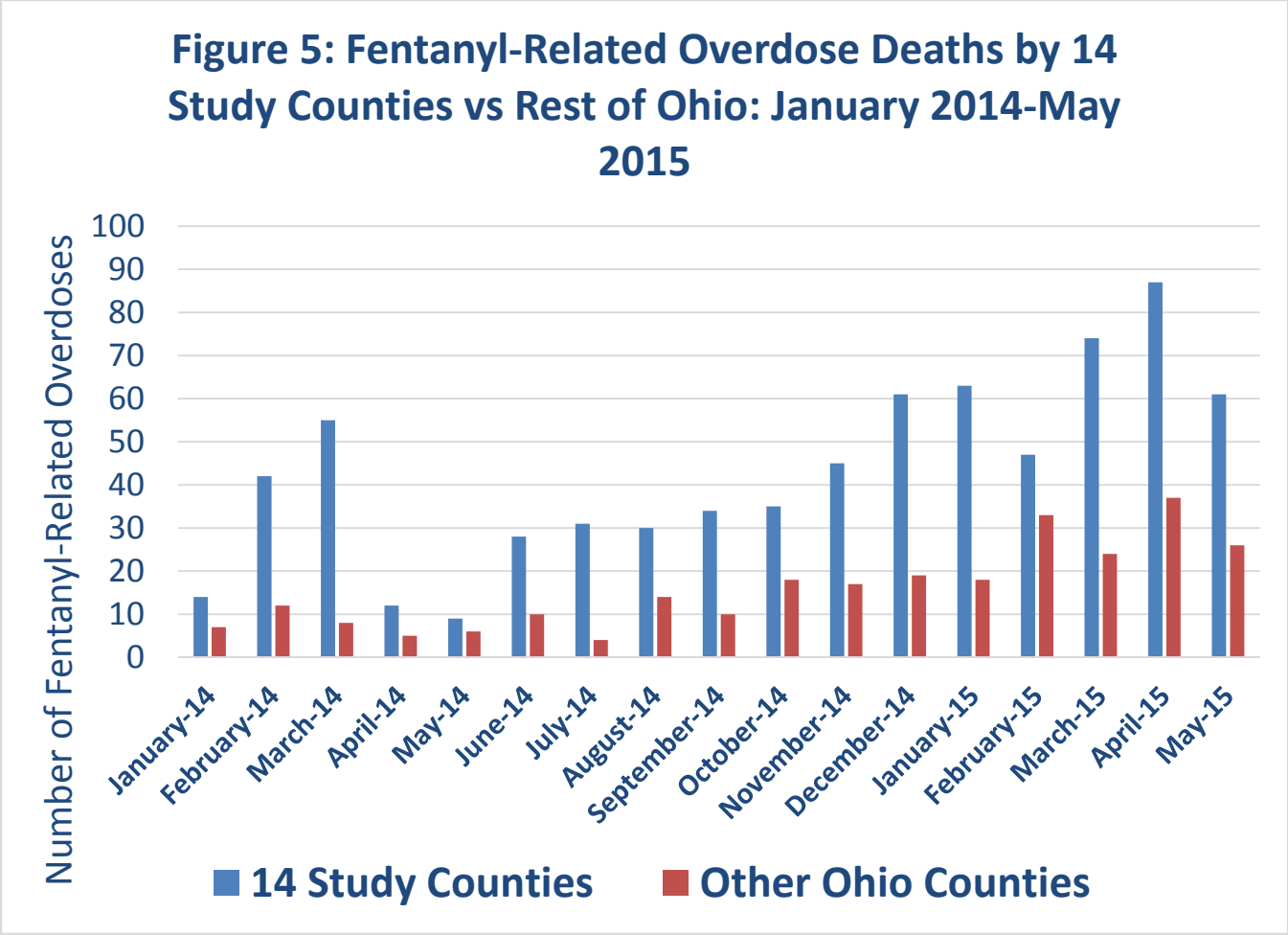
| Type of County | # of Counties in Ohio | % of Ohio's Population | % of Heroin Deaths | Rate of Heroin Deaths per 100,000 | % of Fentanyl Deaths | Rate of Fentanyl Deaths per 100,000 |
|---|---|---|---|---|---|---|
| Large metropolitan (> 1 million) | 20 | 49.2% | 55.7% | 12.0 | 46.8% | 4.31 |
| Moderate metropolitan (250k to 1 million) | 13 | 26.0% | 26.4% | 10.7 | 38.0% | 6.63 |
| Small metropolitan (< 250k) | 5 | 4.3% | 3.4% | 8.4 | 2.3% | * |
| Urban population, adjacent to metro (>20k) | 22 | 13.0% | 9.4% | 7.7 | 6.5% | 2.26 |
| Urban population, adjacent to metro (2,500 to 19,999) | 20 | 5.7% | 4.1% | 7.6 | 5.9% | 4.70 |
| All Other | 8 | 1.8% | 1.0% | * | ^ | ^ |

*Rate not reported because estimate would be unreliable because fewer than 20 deaths occurred in this type of county.

^Fewer than 10 deaths occurred in these types of counties. As a result, data was suppressed to protect confidentiality.

A limitation of these findings is that reporting of the specific drug(s) involved in unintentional fatal overdoses varied by county in Ohio. On average, Ohio counties do not report the specific drug(s) involved in 13.9% of fatal drug overdoses. This will result in under-estimating the rates of drug-specific overdoses such as overdoses related to heroin or fentanyl. A closer examination of the extent to which this rate varied by county was performed in order to identify counties with lower reporting rates and thus larger underestimations of heroin and fentanyl-related overdoses. Half of Ohio's counties report specific drug information on 94% or more of drug overdose deaths. In terms of the 22 counties included in the 14 study counties or the earlier heroin analysis, only 5 counties reported specific drug(s) in fewer than 90% of unintentional drug overdose deaths. These 5 counties and the percent of drug overdoses with no information on specific drug(s) causing the overdose are: Miami (16%), Montgomery (33%), Ross (10.3%), Scioto (41%) and Warren (27.5%).

***4.1.3 Fourteen study counties***: In-depth analyses of fentanyl-related deaths were performed in 14 of 88 counties. These counties represented the 8 counties reporting the highest number of fentanyl-related deaths in 2014 and collectively captured 73% percent of reported fentanyl-related deaths in 2014 and the first five months of 2015. Study counties had a higher rate of fentanyl-related deaths than other Ohio counties (7.7 per 100,000 residents versus 2.0 per 100,000 residents in study and non-study counties, respectively). Study counties were concentrated in large and moderately sized metropolitan areas. The trend in fentanyl-related deaths over time is similar in study and non-study counties (See Figure 5).




Before the sharp increase in fentanyl-related overdose deaths, the study counties were disproportionately being impacted by heroin overdoses. In 2013, study counties accounted for 62% of all heroin-related deaths in Ohio and had a higher rate of heroin deaths than other counties (11.8 versus 6.0 per 100,000 residents). Both study and non-study counties experienced a similar increase in heroin deaths rates from 2013 to 2014 of about 2.0 people per 100,000 residents (11.8 to 13.9 in study counties and 6.0 to 7.9 per 100,000 in non-study counties).

### *4.2 National Violent Death Reporting System (NVDRS):*

Between 01/01/2014 and 12/31/2014 there were a total of 456 overdose deaths with fentanyl listed as a cause of death within the toxicology report for the 14 study counties. Table 4 summarizes the demographic characteristics of the fentanyl decedents. The majority of cases were male (70.0%), white (89.3%), and were single/never married (54.0%). The average age of fentanyl decedents was 37.9 years old (SD 11.3), with ages ranging from 17 to 71 years old. Most individuals died in a house or apartment (81.8%), and 64.0% died in their own homes. The majority of deaths occurred (72.3%) when some type of bystander was present. The route of drug administration tended to be unknown (57.7%), with over a third using injection as the route of administration (39.5%). Emergency Medical Services were present in 82.2% of fentanyl-related deaths, and Naloxone was reported to be administered to 40.8% of fentanyl decedents. This disparity could be explained by a number of factors, including the possible lack of reporting of administered naloxone, the patient having been pronounced dead on arrival by EMS and naloxone thus not being indicated, and possible missed opportunities for EMS to administer naloxone.

Almost all fentanyl decedents (91.0%) had a substance abuse problem, 9.5% had alcohol problems and a quarter (25%) had a current mental health problem. The most common types of mental health problems include depression, anxiety, and bipolar disorder. A total of 46 cases (10.1%) had been released from some type of facility (e.g., jail, hospital, treatment facility) in the past month. Of those that had recently been released from any type of facility, the majority died in Montgomery County, followed by Butler and Hamilton County, then Cuyahoga.

Close to half (48.5%) of fentanyl cases were reported to have drug paraphernalia found on the scene, in 14.3% of cases drugs were found at the scene, and 26.1% of cases had track marks on the body. The majority had a history of (any) opioid use (77.0%).

| **Table 4. Characteristics of cases of fentanyl overdose occurring between 01/01/2014-12/31/2014.** | | |
|---|---|---|
| | % | (n) |
| Gender | | |
| Male | 70.0 | (319) |
| Female | 30.0 | (137) |
| Race | | |
| White | 89.3 | (407) |
| Black | 9.4 | (43) |
| Marital Status | | |
| Never Married/Single | 54.0 | (244) |
| Divorced, separated, widowed | 28.8 | (130) |
| Married | 17.3 | (78) |
| Education Level | | |
| Less than high school | 21.3 | (97) |
| High school to some college | 66.7 | (304) |
| More than an associate's degree | 12.1 | (55) |
| Current Mental Health Problem | | |
| Yes | 25.0 | (103) |
| No | 75.0 | (309) |

| | | |
|---|---|---|
| Substance Abuse | 8.5 | (35) |
| EMS Present | 82.2 | (375) |
| Alcohol Use Suspected | 10.8 | (49) |
| Current or former military | 6.6 | (30) |
| Alcohol Problems | 9.5 | (39) |
| Location of Injury | | |
| House, apartment | 81.8 | (373) |
| Hotel/Motel | 3.5 | (16) |
| Died in a house | 81.8 | (373) |
| Died in a hotel | 3.5 | (16) |
| Route of Administration | | |
| Injection | 39.5 | (180) |
| Snorting | 4.6 | (21) |
| Unknown Route | 57.7 | (263) |
| Injured at Own Home | 64.0 | (292) |
| Release from Any Facility | 10.1 | (46) |
| Montgomery | 52.4 | (22) |
| Hamilton | 14.3 | (6) |
| Cuyahoga | 9.5 | (4) |
| Butler | 14.3 | (6) |
| Bystanders Present | 72.3 | (251) |
| Naloxone Administered | 40.8 | (161) |
| Cocaine listed as contributing cause of death | 23.0 | (105) |
| Heroin listed as contributing cause of death | 38.8 | (177) |
| Number of Substances Listed as Cause of Death | | |
| 1 | 27.4 | (125) |
| 2-3 | 50.0 | (228) |
| 4-6 | 17.1 | (78) |
| >=7 | 5.5 | (25) |
| Number of Substances Tested Positive For in Toxicology | | |
| 1 | 9.3 | (37) |
| 2-3 | 34.3 | (137) |
| 4-6 | 48.0 | (192) |
| >=7 | 8.5 | (34) |
| Any listed Mental Health Diagnosis | 30.9 | (141) |
| Depression/dysthymia (of people with a mental health diagnosis) | 36.2 | (51) |
| Bipolar disorder (of people with a mental health diagnosis) | 12.8 | (18) |
| Anxiety disorder (of people with a mental health diagnosis) | 23.4 | (33) |
| Death Scene Characteristics | | |
| Drug Paraphernalia at Scene | 48.5 | (221) |
| Track Marks | 26.1 | (119) |
| Drugs found on Scene | 14.3 | (65) |

| | | |
|---|---|---|
| Prescription drugs prescribed to another person | 2.0 | (9) |
| History of Any Opioid Use | 77.0 | (335) |

***4.2.1 Comparison of fentanyl overdose deaths to heroin (not fentanyl) overdose deaths***:
Between 01/01/2014 and 12/31/2014 there were a total of 618 overdose deaths with heroin listed as a cause of death within the toxicology report for the 14 study counties. These deaths were compared to fentanyl overdose cases and those comparisons are summarized in Table 5. The average age of heroin cases was 39.9 years old (SD 11.7), with an age range of 17-71, which is significantly older than the average age of fentanyl cases (39.9 vs 37.9, p=0.005). Nearly two out of three fentanyl overdose decedents were 25 to 44 years of age (62%) compared to 1 out 2 heroin overdose decedents (53%). More work needs to be done to understand the tendency of fentanyl-related decedents to be younger.

Fentanyl and heroin overdose decedents had similar characteristics with regards to sex, race, marital status, and education. Fentanyl and heroin overdose decedents were also similar in location of death, EMS presence at scene, naloxone administration, and presence of bystanders when overdosed. The routes of drug administration between fentanyl and heroin cases were similar, as were materials found at the scene. Furthermore, 56% of fentanyl overdose decedents tested positive for heroin or cocaine and cocaine or heroin contributed to 51% of the fatal fentanyl-related overdoses. The scene and demographic similarities between fentanyl and heroin-related overdoses coupled with the high percent of fentanyl-related decedents who tested positive for heroin or cocaine suggest that these overdoses are affecting similar populations. This information is consistent with findings from other data sources that the vast majority of fentanyl-related deaths involve illicitly made fentanyl that is mixed with or sold as heroin.

Fentanyl decedents were significantly less likely to have alcohol use suspected in their death, and were significantly less likely to have a history of any opioid use than heroin cases. Heroin decedents were significantly more likely to have 1 substance listed as a cause of death than fentanyl decedents.

Table 5: Comparison of fentanyl overdose deaths to heroin overdose deaths

| Variable | Fentanyl % (n) | Heroin (excluding fentanyl case) % (n) | OR (95% Confidence Interval) |
|---|---|---|---|
| Age | | | |
| ≤14 | 0 (0) | 0 (0) | -- |
| 15-24 | 10.53 (48) | 9.06 (56) | ** |
| 25-34 | 33.77 (154) | 28.96 (179) | 1.00 (0.65-1.6) |
| 35-44 | 28.51 (130) | 24.11 (149) | 1.01 (0.65-1.6) |
| 45-54 | 17.32 (79) | 26.05 (161) | 0.55 (0.35-0.88) |
| 55-64 | 8.77 (40) | 10.68 (66) | 0.71 (0.41-1.23) |
| 65-74 | 1.10 (5) | 1.13 (7) | -- |
| ≥75 | 0 (0) | 0 (0) | -- |
| Gender | | | |
| Male | 70.0 (319) | 72.8 (450) | 0.9 (0.7-1.1) |
| Female | 30.0 (137) | 27.2 (168) | ** |
| Race | | | |

| | | | |
|---|---|---|---|
| White | 89.3 (407) | 90.8 (561) | ** |
| Black | 9.4 (43) | 8.1 (50) | 1.2 (0.8-1.8) |
| Marital Status | | | |
| Never Married/Single | 54.0 (244) | 49.3 (299) | 1.1 (0.7-1.4) |
| Divorced, separated, widowed | 28.8 (130) | 34.8 (211) | 0.8 (0.5-1.1) |
| Married | 17.3 (78) | 16.0 (97) | ** |
| Education Level | | | |
| Less than high school | 21.3 (97) | 23.8 (147) | 0.6 (0.4-1.0) |
| High school to some college | 66.7 (304) | 67.6 (418) | 0.7 (0.5-1.1) |
| More than an associate's degree | 12.1 (55) | 8.6 (53) | ** |
| Military | 6.6 (30) | 5.5 (34) | 1.2 (0.7-2.0) |
| Current Mental Health Problem | 25.0 (103) | 26.4 (154) | 0.9 (0.7-1.2) |
| Any listed Mental Health Diagnosis | 30.9 (141) | 33.7 (208) | |
| Depression/dysthymia (among people with mental health disorders) | 36.2 (51) | 31.7 (66) | 1.2 (0.8-1.9) |
| Anxiety disorder (among people with mental health disorders) | 23.4 (33) | 22.6 (47) | 1.1 (0.6-1.7) |
| Bipolar disorder (among people with mental health disorders) | 12.8 (18) | 18.8 (39) | 0.6 (0.4-1.2) |
| Substance Abuse | 8.5 (35) | 9.4 (55) | 0.8 (0.6-1.4) |
| Alcohol Problems | 9.5 (39) | 18.7 (109) | 0.5 (0.3-0.7) |
| History of Any Opioid Use | 77.0 (335) | 84.1 (507) | 0.6 (0.5-0.9) |
| Alcohol Use Suspected | 10.8 (49) | 18.0 (111) | 0.5 (0.4-0.8) |
| EMS Present | 82.2 (375) | 86.9 (536) | 0.9 (0.4-1.8) |
| Any Bystanders Present | 72.3 (251) | 70.0 (317) | 1.1 (0.8-1.5) |
| Any Naloxone Administered | 40.8 (161) | 43.7 (244) | 0.9 (0.7-1.2) |
| Injured at Own Home | 64.0 (292) | 55.7 (344) | 1.4 (1.1-1.8) |
| Location of Injury | | | |
| House, apartment | 81.8 (373) | 78.5 (485) | 1.2 (0.9-1.7) |
| Hotel/Motel | 3.5 (16) | 3.7 (23) | 0.9 (0.5-1.8) |
| Route of Administration | | | |
| Injection | 39.5 (180) | 36.6 (226) | 1.1 (0.9-1.5) |
| Snorting | 4.6 (21) | 6.5 (40) | 0.7 (0.4-1.2) |
| Unknown Route | 57.7 (263) | 57.6 (356 | 1.0 (0.8-1.3) |
| Cocaine listed as contributing cause of death | 23.0 (105) | 25.4 (157) | 0.9 (0.6-1.2) |
| Heroin listed as contributing cause of death | 38.8 (177) | 100 (618 | Not applicable |
| Release from Any Facility | 10.1 (46) | 12.5 (77) | 0.8 (0.5-1.2) |
| Montgomery | 52.4 (22) | 16.2 (11) | |
| Hamilton | 14.3 (6) | 23.5 (16) | |

| | | | |
|---|---|---|---|
| Cuyahoga | 9.5 (4) | 30.9 (21) | |
| Butler | 14.3 (6) | 8.8 (6) | |
| Materials found at scene | | | |
| Drug Paraphernalia at Scene | 48.5 (221) | 43.5 (269) | 1.2 (1.0-1.6) |
| Track Marks | 26.1 (119) | 21.8 (135) | 1.3 (1.0-1.7) |
| Drugs found on Scene | 14.3 (65) | 16.3 (101) | 0.9 (0.6-1.2) |
| Prescription drugs prescribed to another person | 2.0 (9) | 2.6 (16) | 0.8 (0.3-1.7) |
| Number of Substances Listed as Cause of Death | | | |
| 1 | 27.4 (125) | 37.1 (229) | 0.6 (0.5-0.8) |
| 2-3 | 50.0 (228) | 45.0 (278) | 1.2 (1.0-1.6) |
| 4-6 | 17.1 (78) | 14.4 (89) | 1.2 (0.9-1.7) |
| >=7 | 5.5 (25) | 3.6 (22) | 1.6 (0.9-2.8) |
| Number of Substances Tested Positive For in Toxicology | | | |
| 1 | 9.3 (37) | 4.2 (22) | 2.3 (1.4-4.0) |
| 2-3 | 34.3 (137) | 22.3 (117) | 1.8 (1.4-2.4) |
| 4-6 | 48.0 (192) | 61.1 (321) | 0.6 (0.5-0.8) |
| >=7 | 8.5 (34) | 12.4 (65) | 0.7 (0.4-1.0) |

**=referent category

### 4.2.2 Comparison of fentanyl overdose deaths to prescription opioid deaths

Between 01/01/2014 and 12/31/2014 there were a total of 262 overdose deaths with another opioid (excluding heroin and fentanyl) listed as the cause of death, which can be considered prescription opioid deaths. These deaths were compared to fentanyl overdose deaths and those comparisons are summarized in Table 6. Fentanyl decedents were different in several characteristics compared to individuals that died from prescription opioids. These differences are consistent with previously documented national differences in the demographic characteristics of prescription opioid pain reliever (OPR)[8] and heroin-related overdose deaths.[9] Specifically, in 2013, the rate of heroin overdoses was highest among non-Hispanic white people aged 18-44 and the number of heroin-involved overdoses was nearly four times higher for men than women. In contrast, previous descriptions of OPR-related overdose deaths found that the death rates were highest among person 35-54 years of age (i.e., slightly older than the average heroin decedents) and males were about 1.5 times more likely to die of an OPR-related overdose than women. Again, this suggests that the fentanyl-related deaths are occurring in populations more similar to heroin-related deaths (i.e., younger and more male) than OPR-related deaths.

The average age of prescription opioid decedents was 46.4 years old (SD 11.4), with an age range of 21-74. Fentanyl cases were significantly younger (mean=37.9, SD=11.3, Range 17-71) than prescription opioid decedents ($p<.001$). Fentanyl decedents were significantly more likely to be male and single/never married than prescription opioid decedents.

[8] http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6043a4.htm

[9] See http://www.cdc.gov/nchs/data/databriefs/db190.pdf

Fentanyl decedents were significantly more likely to have a current mental health problem and a history of opioid use than prescription opioid cases. Prescription opioid decedents were more likely to have alcohol and substance abuse problems than fentanyl decedents. Prescription opioid decedents were also more likely to die in their own home compared to individuals that died by fentanyl.

Fentanyl decedents were significantly more likely to have been recently released from an institution such as jail, a hospital or treatment facility. At the scene, individuals that died by fentanyl were more likely to have drug paraphernalia found, to have track marks on the body, and to have drugs found on the scene. Prescription opioid decedents were more likely to have prescription drugs prescribed to another person found on the scene.

Table 6. Comparison of fentanyl overdose deaths to prescription opioid overdose deaths.

| | Fentanyl % (n) | Prescription Opioid % (n) | OR (95% Confidence Interval) |
|---|---|---|---|
| Age | | | |
| ≤14 | 0 (0) | 0 (0) | -- |
| 15-24 | 10.53 (48) | 3.82 (10) | ** |
| 25-34 | 33.77 (154) | 14.89 (39) | 0.82 (0.4-1.8) |
| 35-44 | 28.51 (130) | 23.28 (61) | 0.4 (0.21-0.93) |
| 45-54 | 17.32 (79) | 30.92 (81) | 0.2 (0.1-0.43) |
| 55-64 | 8.77 (40) | 8.77 (63) | 0.13 (0.1-0.3) |
| 65-74 | 1.10 (5) | 1.11 (8) | -- |
| ≥75 | 0 (0) | 0 (0) | -- |
| Gender | | | |
| Male | 70.0 (319) | 55.0 (144) | 1.9 (1.4-2.6) |
| Female | 30.0 (137) | 45.0 (118) | ** |
| Race | | | |
| White | 89.3 (407) | 90.5 (237) | ** |
| Black | 9.4 (43) | 8.4 (22) | 1.1 (0.7-2.0) |
| Marital Status | | | |
| Never Married/Single | 54.0 (244) | 31.2 (81) | 2.7 (1.8-4.1) |
| Divorced, separated, widowed | 28.8 (130) | 41.5 (108) | 1.1 (0.7-1.7) |
| Married | 17.3 (78) | 27.3 (71) | ** |
| Education Level | | | |
| Less than high school | 21.3 (97) | 24.4 (64) | 1.2 (0.7-2.1) |
| High school to some college | 66.7 (304) | 58.4 (153) | 1.6 (1.1-2.5) |
| More than an associate's degree | 12.1 (55) | 17.2 (45) | ** |
| Military | 6.6 (30) | 9.5 (25) | 0.7 (0.4-1.2) |
| Current Mental Health Problem | 25.0 (103) | 44.2 (103) | 0.4 (0.3-0.6) |
| Any listed Mental Health Diagnosis | (141) | (139) | |

| | | | |
|---|---|---|---|
| Depression/dysthymia | 36.2 (51) | 54 | 0.9 (0.4-2.0) |
| Anxiety disorder | 23.4 (33) | 38 | 0.8 (0.4-1.9) |
| Bipolar disorder | 12.8 (18) | 18 | ** |
| Alcohol Problems | 9.5 (39) | 18.9 (44) | 0.4 (0.3-0.7) |
| Alcohol Use Suspected | 10.8 (49) | 11.8 (31) | 0.9 (0.6-1.5) |
| Substance Abuse | 8.5 (35) | 27.0 (63 | 0.3 (0.2-0.4) |
| History of Any Opioid Use | 77.0 (335) | 52.0 (132) | 3.1 (2.2-4.3) |
| EMS Present | 82.2 (375) | 83.2 (218) | 1.0 (0.4-2.4) |
| Any Bystanders Present | 72.3 (251) | 70.2 (134) | 1.1 (0.8-1.6) |
| Any Naloxone Administered | 40.8 (161) | 44.9 (109) | 0.9 (0.6-1.2) |
| Injured at Own Home | 64.0 (292) | 79.4 (208) | 0.4 (0.3-0.6) |
| Cocaine listed as contributing cause of death | 23.0 (105) | 14.89 (39) | 1.7 (1.1-2.6) |
| Heroin listed as contributing cause of death | 38.8 (177) | 0 (0) | Not applicable |
| Location of Injury | | | |
| House, apartment | 81.8 (373) | 88.2 (231) | 0.5 (0.2-1.4) |
| Hotel/Motel | 3.5 (16) | 1.9 (5) | ** |
| Any Release from Institution | 10.1 (46) | 4.2 (11) | 2.6 (1.3-5.1) |
| Route of Administration | | | |
| Injection | 39.5 (180) | 6.5 (17) | 9.4 (5.5-15.9) |
| Snorting | 4.6 (21) | 4.2 (11) | 1.1 (0.5-2.3) |
| Unknown Route | 57.7 (263) | 61.8 (162) | 0.8 (0.6-1.2) |
| Materials found at scene | | | |
| Drug Paraphernalia at Scene | 48.5 (221) | 14.1 (37) | 5.7 (3.9-8.5) |
| Track Marks | 26.1 (119) | 3.4 (9) | 9.9 (5.0-9.9) |
| Drugs found on Scene | 14.3 (65) | 3.1 (8) | 5.4 (2.6-1.5) |
| Prescription drugs prescribed to another person | 2.0 (9) | 5.7 (15) | 0.3 (0.1-0.8) |
| Number of Substances Listed as Cause of Death | | | |
| 1 | 27.4 (125) | 30.92 (81) | 0.8 (0.4-1.7) |
| 2-3 | 50.0 (228) | 40.84 (107) | 1.1 (0.6-2.3) |
| 4-6 | 17.1 (78) | 23.28 (61) | 0.7 (0.3-1.4) |
| >=7 | 5.5 (25) | 4.96 (13) | ** |
| Number of Substances Tested Positive For in Toxicology | | | |
| 1 | 9.3 (37) | 7.3 (17) | 1.3 (0.6-2.8) |
| 2-3 | 34.3 (137) | 34.9 (81) | 1.0 (0.5-1.8) |
| 4-6 | 48.0 (192) | 49.1 (114) | 1.0 (0.5-1.8) |
| >=7 | 8.5 (34) | 8.6 (20) | ** |

**=referent category

### *4.3 Ohio Automated RX Reporting System (OARRS):*

Overall, 68.3% (n= 1709) of unintentional drug overdose decedents in 2014 had a prescription history recorded in the Ohio Automated RX Reporting System (OARRS); 67.8% (n= 341) of fentanyl-related unintentional overdose decedents had a prescription history in OARRS, 61.8% (n= 654) of heroin-related decedents, 68.0% (n= 287) of prescription opioid-related decedents, and 80.4% (n= 427) of other drug-related decedents.

Approximately 30% (n= 742) of all unintentional drug overdose decedents had a record for a prescription opioid in OARRS in the month prior to their death.

- Approximately one in four (27.6%) fentanyl-related decedents had a recorded prescription opioid in the month prior to death
- One in five (20.5%) heroin-related decedents had a recorded prescription opioid in the month prior to death
- Forty-four percent of prescription opioid-related decedents had a recorded prescription opioid in the month prior to death

The percent of decedents who had a record for a prescription opioid in OARRS in the month prior to their death was statistically significant across all categories ($\chi^2(3) = 106.407$, $p = .000$).

Additional key findings from the examination of the OARRS data include:

- More than one in ten heroin-related (n=668) and approximately one in five fentanyl-related (n=331) decedents had a recorded morphine equivalent dosage (MED) for total prescribed opioid at the time of death (11.8% and 18.5% respectively). Approximately two in five prescription opioid-related decedents had a recorded morphine equivalent dosage (MED) for total prescribed opioid at the time of death (39.7%) See Table 7
    - Decedents in which prescription opioids were implicated as the cause of death were significantly more likely to have been prescribed opioids with a MED at death ≥ 50, compared to fentanyl decedents (24.5% vs 12.3% respectively, $\chi^2(1)=22.854$, $p < .001$) or heroin decedents (24.5% vs 4.9% respectively, $\chi^2(1)=122.181$, $p < .001$).
- Two-thirds of all fentanyl-related and approximately 60% of heroin-related decedents had a record of opioid prescription at some point during the seven years period preceding their death. See Table 8
    - Compared to heroin-related decedents, significantly more fentanyl-related decedents (45.4% vs 54.7% respectively, $\chi^2(1)=4.604$, $p < .05$) had a record of opioid prescription equal to or greater than 50 MED in the 2007-2014 time period.
    - A substantial percentage of fentanyl-related and heroin-related decedents (39.6% and 32.6% respectively) had a record of opioid prescriptions with a maximum dose equal to or greater than 90 MED at some point during the seven year period preceding their death.

- The majority of decedents involved in a prescription opioid overdose (65.0%) had a history of opioid prescription which exceeded 50 morphine equivalent dosage (MED) at some point during 2007-2014.
    - Decedents who had prescription opioids implicated in cause of death were significantly more likely to have been prescribed an opioid with a maximum MED ≥ 50 at some point during the seven years period preceding their death compared to heroin-related decedents (60.0% vs 45.6% respectively, $\chi^2(1)=53.276$, $p < .001$).
- Significantly more prescription opioid-related decedents had a benzodiazepine drug co-implicated in their death compared to fentanyl-related decedents (21.8% vs 13.3% respectively, $\chi^2(1)=11.595$, $p < .001$) and heroin-related decedents (21.8% vs 9.1% respectively, $\chi^2(1)=44.066$, $p < .001$).

| Table 7: Comparison of total dose of prescribed opioid at time of death for drug poisoning decedents by category | | | **MED at Death** | | | | |
|---|---|---|---|---|---|---|---|
| | | | 0 | 1-<20 | 20-<50 | 50-<90 | >=90 |
| Drug implicated in death | No opioid indicated (n=531) | Count | 371 | 21 | 60 | 25 | 54 |
| | | % | 69.9% | 4.0% | 11.3% | 4.7% | 10.2% |
| | Fentanyl (n=503) | Count | 410 | 9 | 22 | 9 | 53 |
| | | % | 81.5% | 1.8% | 4.4% | 1.8% | 10.5% |
| | Heroin (n=1058) | Count | 932 | 28 | 46 | 15 | 37 |
| | | % | 88.1% | 2.6% | 4.3% | 1.4% | 3.5% |
| | Prescription opioid (n=422) | Count | 255 | 11 | 53 | 31 | 72 |
| | | % | 60.3% | 2.6% | 12.6% | 7.4% | 17.1% |

$\chi^2(12) = 198.242$, $p = .000$

| Table 8: Comparison of maximum prescribed opioid dose during 2007-2014 for drug poisoning decedents by category | | | Max MED on Record | | | | |
|---|---|---|---|---|---|---|---|
| | | | 0 | 1-<20 | 20-<50 | 50-<90 | >=90 |
| Drug implicated in death | No opioid indicated (n=531) | Count | 121 | 7 | 15 | 96 | 232 |
| | | % | 22.8% | 1.3% | 14.1% | 18.1% | 43.7% |
| | Fentanyl (n=503) | Count | 170 | 4 | 54 | 76 | 199 |
| | | % | 33.8% | 0.7% | 10.7% | 15.1% | 39.6% |
| | Heroin (n=1058) | Count | 425 | 13 | 140 | 135 | 345 |
| | | % | 40.2% | 1.2% | 13.2% | 12.8% | 32.6% |
| | Prescription opioid (n=422) | Count | 148 | 2 | 19 | 42 | 211 |
| | | % | 35.1% | 0.5% | 4.5% | 10.0% | 50.0% |

$\chi^2(12) = 97.733$, $p = .000$

### *4.4 Enhanced surveillance of heroin and fentanyl-related overdose morbidity*

Two limitations of Vital Statistics (VS) mortality data are:

- There is a time lag of six to eight months to gain access to preliminary VS mortality data
- Non-fatal overdose data are more numerous and can often be collected more quickly, and thus may be more sensitive to changing patterns in harmful drug use.

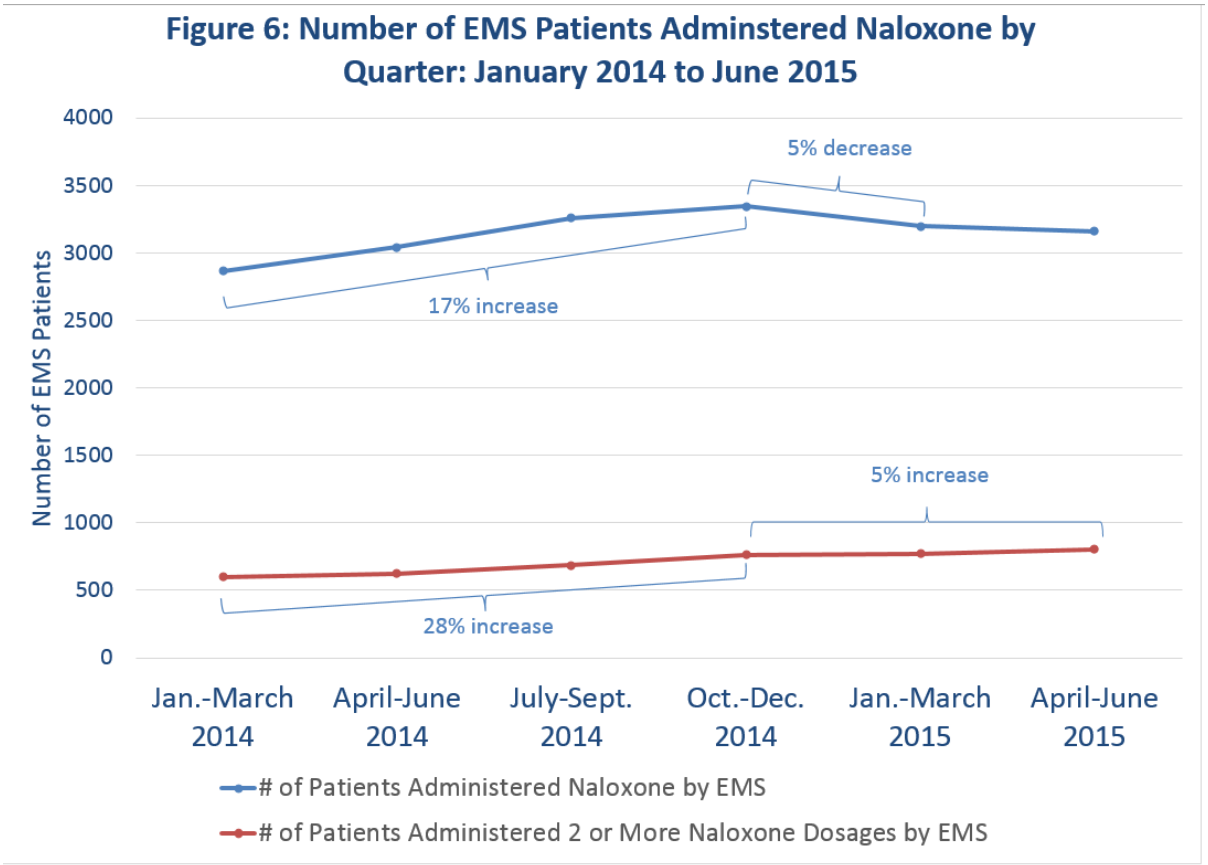
To examine the utility of various sources of non-fatal drug overdose data, these analyses investigated the extent to which three data sources: Emergency Medical Services (EMS) naloxone administration, Emergency Department (ED) chief complaint information, and reported fentanyl-related drug seizures from the DEA, could be used as leading indicators for changes in prescription opioid, heroin, and fentanyl-related deaths. Indicators for heroin-related nonfatal overdoses among ED and EMS data were explored because fentanyl-related deaths often occurred when fentanyl was mixed with heroin or was sold as heroin. Thus, tracking heroin nonfatal overdoses will enable the identification of areas that are vulnerable to overdoses related to illicitly manufactured fentanyl and detect spikes in mortality related to fentanyl and heroin overdoses. Overdoses were investigated to capture changes in illicit opioids or prescription opioids.

Even if perfectly measured, trends in non-fatal drug overdose will not always match trends in fatal drug overdose, because there are factors that differentially affect morbidity versus mortality, such as the implementation of prevention efforts (e.g., naloxone distribution programs), changes in drug potency, and changes in drug use patterns. For instance, increased naloxone availability and use by community members may decrease heroin and fentanyl-related deaths by reversing these overdoses early, but not impact heroin and fentanyl-related morbidity. Consequently, efforts to track and compare non-fatal drug overdoses and fatal drug overdose mortality overtime should be ongoing. This report did not investigate the extent to which EMS, ED, and drug seizure can be used to track heroin or fentanyl-related fatal overdoses in specific counties and cities over time. Instead, these analyses focused on the ability of these data sources to track trends at the state level.

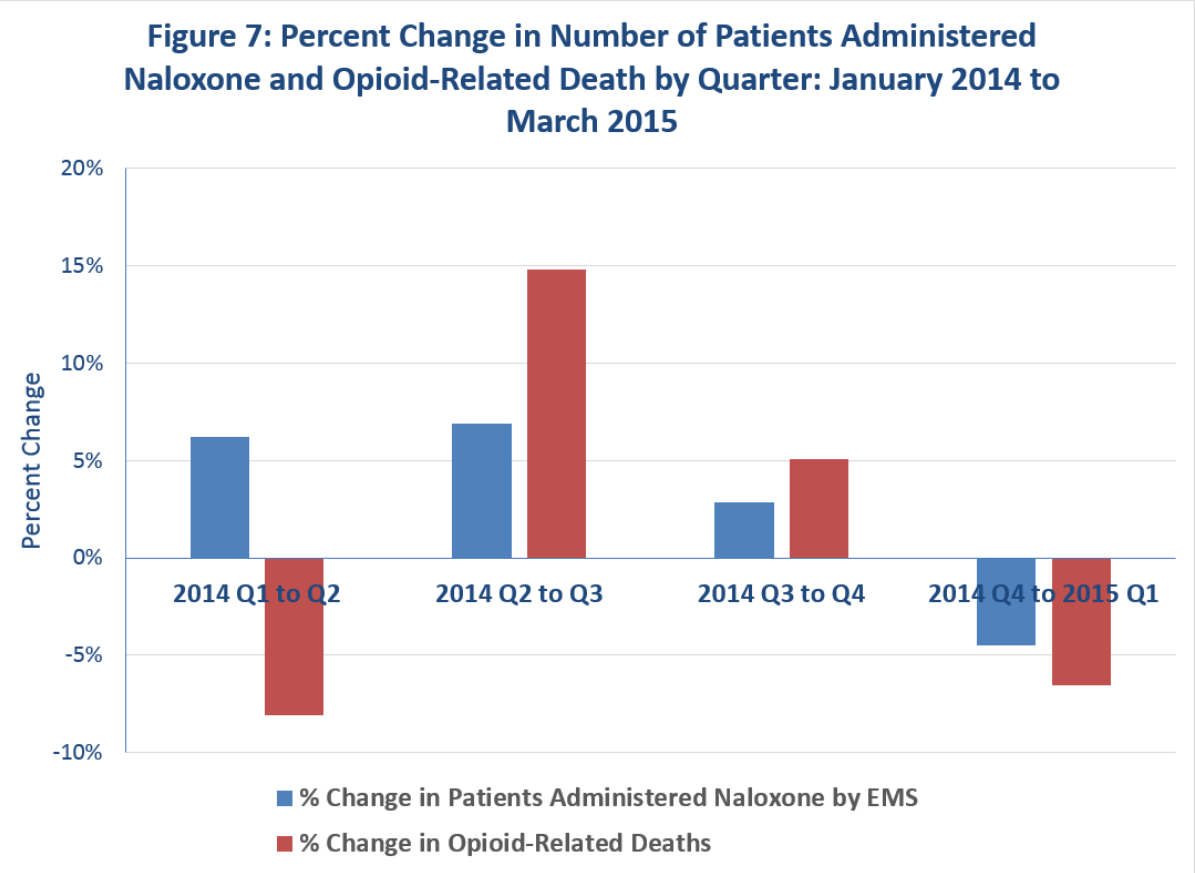
***4.4.1 Emergency medical services (EMS)***: Three key questions were addressed with EMS data:

- What percent of patients administered naloxone by EMS received two or more dosages?
- Can the number of patients administered naloxone by EMS predict changes in opioid overdose deaths overtime?
- Can the number of patients administered multiple dosages of naloxone by EMS predict changes in fentanyl-related overdoses overtime?

*Patients administered naloxone by EMS*: Ohio EMS reported that 12,847 EMS patients were administered naloxone in 2014. This was a 16% increase from 2013 when 11,095 people were administered naloxone. The rate of naloxone administrations in 2015 appears on par with the rate of naloxone administrations 2014, with 6,356 naloxone administrations being reported from January to June 2015, or about half the number of 2014. The number of naloxone administrations steadily increased through 2014 with a 17% increase from the first quarter of 2014 to the final quarter. The number of naloxone administrations slightly declined in the first quarter of 2015 and were stable moving into the second quarter of 2015 (See Figure 6).




The trend in the number of patients receiving naloxone from EMS generally paralleled trends in opioid-related overdose deaths from 2013 to 2015 (e.g., when the number of naloxone administrations went up so did opioid-related overdose deaths), but consistently changed at a slower rate than opioid-related overdose deaths. For instance, from 2013 to 2014, naloxone administration and unintentional opioid-related deaths increased 16% and 33%, respectively. A comparison of the percent change in the number of patients receiving naloxone from EMS to the percent change in opioid deaths during January 2014 to March 2015 suggests that this pattern holds even when three month time periods, or quarters, were analyzed. For 3 out of the 4 changes analyzed, EMS moved in the same direction as opioid mortality and continued to change at a slower rate (See Figure 7).



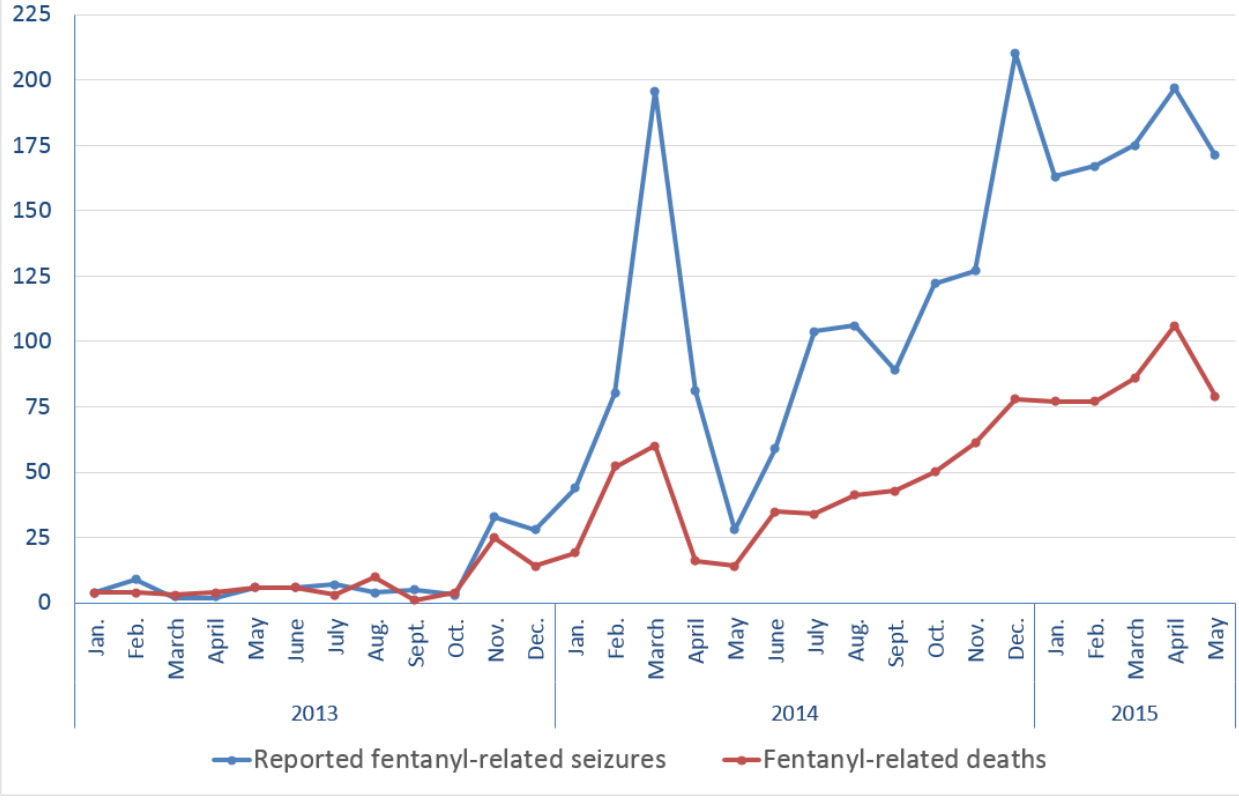

*Patients administered multiple dosages of naloxone by EMS*: Ohio EMS reported that 2,669 EMS patients were administered naloxone two or more times in 2014, referred to as multiple naloxone administrations. The rate of multiple naloxone administrations in 2015 appears slightly higher than in 2014 with 1,571 EMS patients receiving multiple naloxone administrations by mid-year. From another perspective, the percent of patients receiving naloxone who received multiple naloxone administrations increased from 21% in 2014 to 25% in the first half of 2015.

The number of patients receiving multiple naloxone administrations steadily increased through 2014 with a 28% increase from the first quarter of 2014 to the final quarter. The rate of increase slowed in 2015 with multiple naloxone administrations increasing only 5% from the last quarter of 2014 to the second quarter of 2015 (See Figure 5). This indicator did not parallel the tripling in fentanyl-related deaths from June 2014 to April 2015 or the pattern in fatal overall opioid-related deaths.

**4.4.2 National Forensic Laboratory Information System (NFLIS)**: The trend in NFLIS data on fentanyl-related seizures closely mirrored the trends in fentanyl-related deaths from January 2013 to May 2015. Both trends began increasing in November 2013 and reached a peak in March 2014. This peak was following by a decline in April and May 2014 and a steady increase until April 2015 (See Figure 8). Although the trends are strongly related, the trends do diverge in certain months. For instance, a sharp increase in fentanyl-related seizures in December 2014 was not associated with any increase in fentanyl-related deaths. Fluctuations in numerous factors such as the size and type of

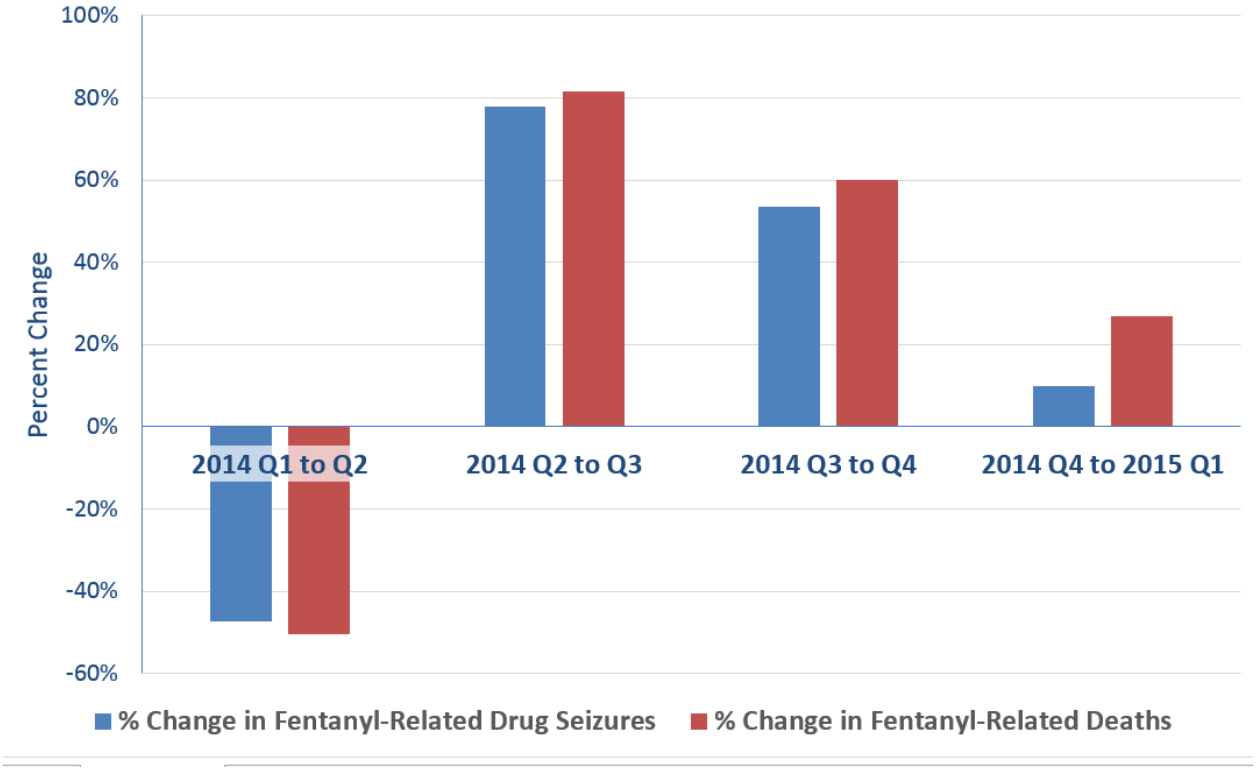
fentanyl-related seizures, improved public health response to opioid overdoses, and an especially potent mixture of heroin and fentanyl could all contribute to these types of discontinuities between the two trends. These exceptions highlight the need to triangulate and review data over multiple months to confirm trends.

**Figure 8: Number of Fatal Fentanyl-Related Overdoses and Reported Drug Seizures: January 2013 to May 2015**




The percentage change in fentanyl-related seizures and fentanyl-related deaths were examined to determine if the indicators were changing at the same or differing rates. To make the estimates more reliable (i.e., more than 20 fentanyl-overdoses and seizures occurring each month), information was compared by quarter. In 2014, the percentage change in the number of fentanyl-related drug seizures and deaths were very similar. Fentanyl-related deaths did change at a slightly faster rate than fentanyl-related seizures (See Figure 9). Across the four quarters of 2014, about 1 fentanyl-related death consistently occurred for every 2.5 fentanyl-related seizures. In the first quarter of 2015, this ratio dropped to about 1 fentanyl-related death for every 2 fentanyl-related seizures. Additional analyses are needed to determine if this represents a shift in the relationship between fentanyl-related seizures and death. Overall, changes in reported fentanyl-related seizures were predictive of changes in fentanyl-related deaths, especially in 2014 as the epidemic began.

**Figure 9: Percent Change in Number of Reported Fentanyl Drug Seizures and Fentanyl-Related Deaths by Quarter: January 2014 to March 2015**



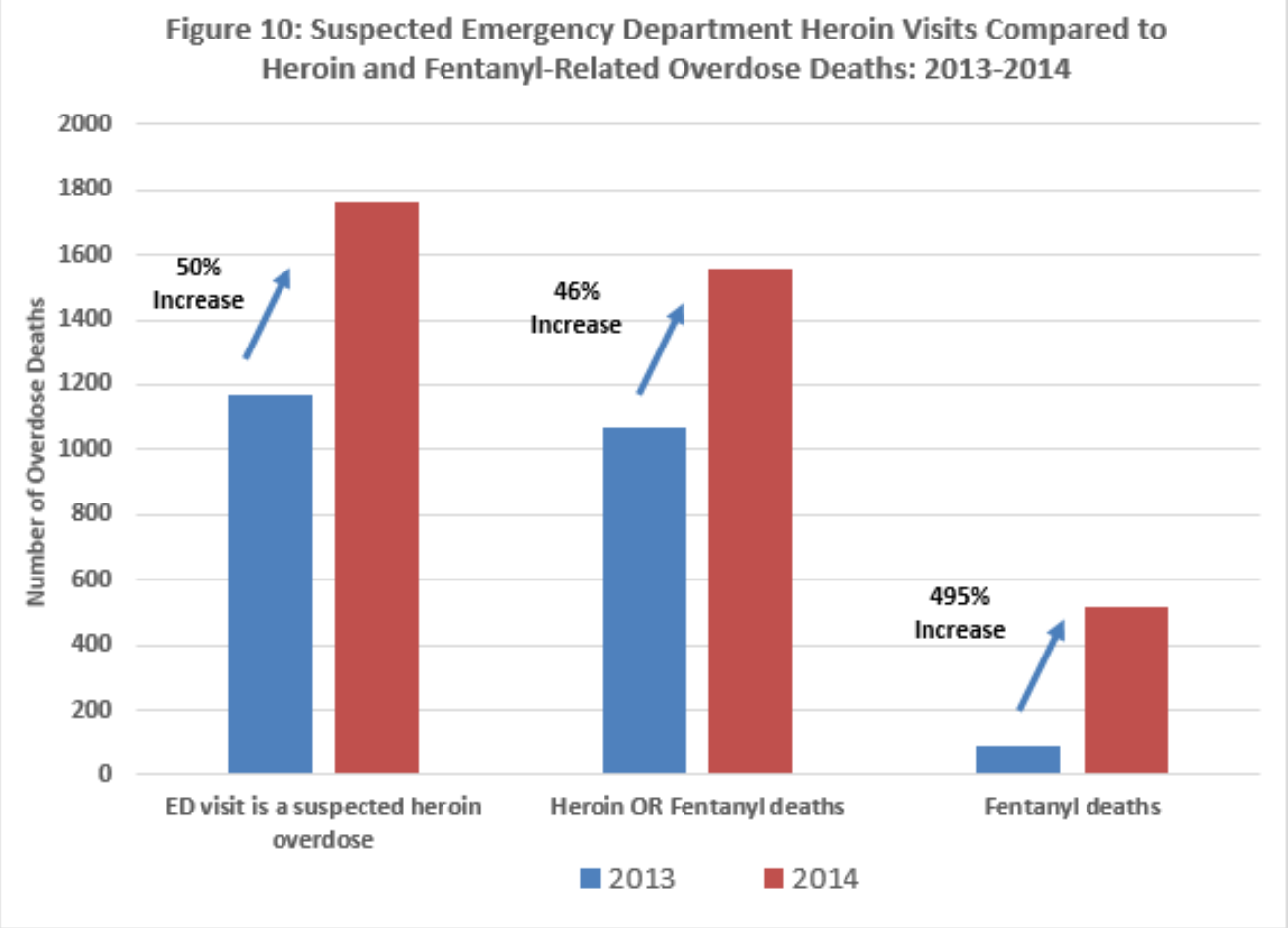

**4.4.3 Emergency Department (ED) Near Real-Time Surveillance:** ED analyses addressed two questions:

- To what extent does the chief complaint capture ED visits related to heroin overdoses?
- Does the trend in heroin-related ED visits predict or parallel heroin-related mortality across a year and quarter?

Analyses of ED chief complaints identified 1,172, 1,763, and 2,369 heroin-related ED visits in 2013, 2014 and January to October 2015, respectively. A comparison between the number of heroin-related ED visits identified in 2013 using Ohio's near real-time surveillance and hospital discharge information (i.e., hospital discharge information provides the most comprehensive count of heroin-related emergency department visits because it relies on complete discharge information) is planned to assess the extent to which near real time surveillance under-estimates heroin-related ED visits. Unfortunately, 2013 hospital discharge data was not yet available. However, ED discharge files from 2012 found about 3,172 ED discharges related to heroin. This data suggest that the ED chief complain search is significantly undercounting ED visits related to heroin overdoses. This is not unexpected because the ED discharge information is based on the medical diagnosis given to the patient after treatment while

the chief complaint captures the patient's condition entering the hospital and before treatment. Also, the critical test of the usefulness of the chief complaint information is whether it can rapidly detect sharp increases in overdoses.

Trends in heroin-related ED visits from 2013 to 2014 were compared to trends in heroin and fentanyl-related mortality. Heroin and fentanyl-related fatal overdoses are combined because fentanyl-related overdoses may present as heroin overdoses to the emergency department because of the mixing of fentanyl with heroin or fentanyl being sold as heroin. Increases in the ED chief complaint, a 50% increase from 2013 to 2014, closely mirror increases in the heroin/fentanyl-related deaths which increased 46% from 2013 to 2014 (See Figure 10).




Further comparisons were done to determine how trends compared by quarter from January 2013 to August 2015. Both ED visits and deaths related to heroin or fentanyl overdoses followed similar patterns across the time period (See Figure 11). Closer inspection of the changes between each quarter, however, reveal different patterns in the ED and mortality data (See Figure 12). From January 2013 to March 2014, ED visits increased at over 10% for three out of the four quarters with the largest increase coming at the beginning of 2013. In contrast, fentanyl/heroin-related mortality demonstrated two sharp increases from 2013 Q2 to Q3 and 2013 Q4 to 2014 Q1. Also, ED visits increased at substantially faster rates than mortality from 2014 Q2 until 2015 Q1. One possible explanation of this

pattern is increased use of naloxone by first responders and community members may be slowing mortality related to overdoses, but not overdoses requiring medical treatment.

Unfortunately, preliminary mortality data indicated increasing heroin and fentanyl-related deaths in the first quarter of 2015. Also, ED visits of heroin-related overdoses continued to rise until June 2015, but did flatten out during July and September 2015. Together the ED and mortality data suggest worsening of the epidemic into 2015 with possible signs of peaking during July and September 2015.

**Figure 11: Suspected Emergency Department Heroin Visits Compared to Heroin/Fentanyl Mortality: Q1 2013 to Q3 2015**

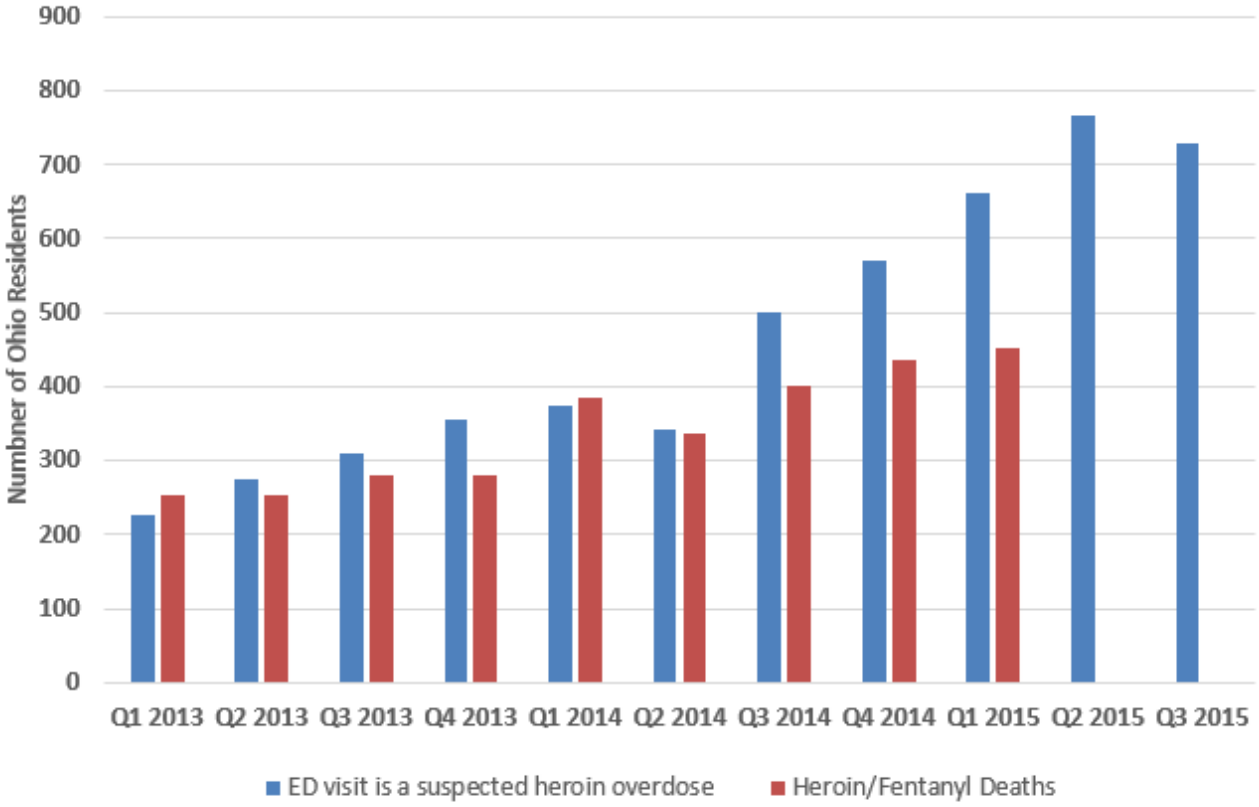
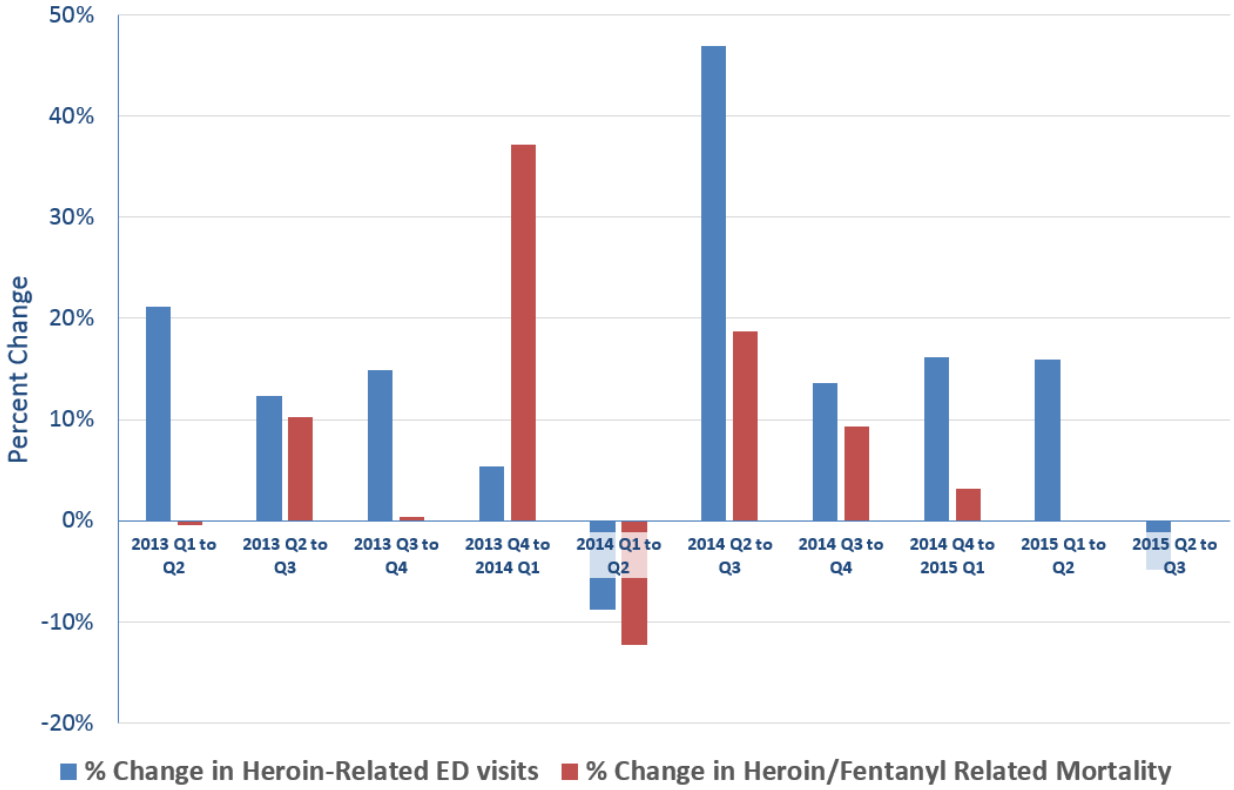


**Figure 12: Percent Change in Heroin/Fentanyl-Related ED visits and Mortality: January 2013 to August 2015**




### 4.5 Ohio Substance Abuse Monitoring Network (OSAM)

A report was produced by the Ohio Substance Abuse Monitoring Network in September, 2015 titled, "Much of Heroin Supply Adulterated with Fentanyl", available at http://mha.ohio.gov/Portals/0/assets/Research/OSAM-TRI/092015-OSAMogram-heroin-fentanyl-update.pdf This OSAM-o-Gram included a table which notates the regions of Ohio in which at least one report of fentanyl as a suspected cut for heroin was reported within OSAM acquired data. The table clearly reveals the widening geographic spread of such reports, with a marked increase in mid-2014, the first period in which all 8 regions were positive for such reporting.

Further key findings from this report include the following:

- "Users, treatment providers and law enforcement from across Ohio reported that much of the heroin supply is adulterated with fentanyl and that fentanyl is often sold as heroin."
- "Several law enforcement agencies throughout Ohio reported purchasing heroin undercover only to discover through lab testing that the heroin specimen was actually fentanyl."
- "When buying white powdered heroin, Youngstown users believed five out of 10 times that what they purchased was fentanyl rather than heroin. In addition, BCI crime labs reported that

they have processed a lot of fentanyl-heroin mix and even straight fentanyl samples submitted as suspected heroin during the past six months."

- "Much of the fentanyl found in heroin reportedly comes from clandestine labs and is not diverted pharmacy-grade fentanyl."
- "Most users reported gray, pink or white powdered heroin as the most potent and desirable types because these types are often cut with fentanyl. However, participants in the Dayton region reported the presence of a type of fentanyl-heroin mix called 'blue drop'".
- "Reportedly, the danger of using fentanyl-cut heroin is well understood by users, but most users expressed seeking it out despite their understanding of the overdose danger."

***4.6 Key Stakeholder Meetings:*** This section reports themes and areas of concern identified by stakeholders and the reporting of these opinions does not indicate endorsement by CDC. Thematic analysis of the discussions held with a wide array of key stakeholders provided important perspectives on what they viewed as key circumstances contributing to the epidemic of fentanyl-related overdoses in the state of Ohio, as well as seven main areas of concern in terms of the public health response to the epidemic.

### 4.6.1 Key Stakeholder Perspectives on Etiologic factors

1. Perspective from Law Enforcement
    i. Dramatic increase in supply of heroin and illicit fentanyl entering the country, and Ohio in particular; the state is a central distribution point for much of the rest of the country.
    ii. Widening geographic spread of countries producing illicit fentanyl (Mexico, Colombia, Southeast Asia, India, and China).
    iii. Increased movement of illicit fentanyl and other synthetic drugs (e.g., Flakka) via internet orders, which enters country through FedEx/UPS.
    iv. Heroin cost very low, and accessibility currently very high.
    v. Fentanyl seen by dealers as an effective tool to improve their heroin product and increase profits and number of customers.
    vi. Decreasing demand for heroin will be as important as decreasing supply.
    vii. Fentanyl's high potency is attractive to dealers because of the ease of transport (smaller quantities required), and high profit margins.
    viii. Persons with heroin addiction have been known to actively seek out heroin cut with fentanyl.
2. Perspective from Harm Reduction
    i. Change in opioid prescribing patterns by physicians towards more judicious prescribing, leaving some patients unable to maintain their opioid addiction through this means, and increasingly looking to other sources of opioids, including illicit sources.
    ii. Heroin market is quite cheap and is easy accessible relative to the diverted pharmaceutical opioid market.
3. Perspective from county government
    i. There was some delay by county officials in recognizing the growing fentanyl problem and mounting an effective response.
4. Perspective from state government

i. Fentanyl is a growing concern for government agencies.
ii. Fentanyl epidemic is placing great strain on state resources, both in terms of budget and staff.
iii. Need to coordinate efforts/share data across government agencies (public health/law enforcement) to respond effectively to the fentanyl problem.

5. Perspective from Treatment Providers
    i. Key driving factor has been the rise in the misuse and abuse of prescription opioids, and the need for more judicious opioid prescribing practices by physicians.
    ii. Pain should no longer be considered a fifth vital sign.
    iii. Key to reducing demand for illicit opioids is expansion of opioid treatment services, particularly Suboxone and in-patient opioid detox.
    iv. Fentanyl can lead to intense withdrawal symptoms (more than heroin and prescription opioids).
    v. Persons dependent on fentanyl are compelled to use it more often to maintain the euphoric effect (than heroin users) due to its short half-life (two hours).
6. Perspective from Medical Examiners/Coroners
    i. Coroners and Medical Examiners recognize a need to increase capacity and technologic advances around mortality record keeping, including electronic record keeping state-wide. This would allow for improved sharing of data between counties, and with state public health authorities.
    ii. Need for increased testing and uniform screening and reporting of fentanyl across all jurisdictions; paucity of resources makes this challenging.
    iii. Believe that many decedents were not aware of presence of fentanyl in the heroin they purchased.
    iv. Fentanyl often leads to near-immediate respiratory depression, evident by data from the scene (e.g. needle still in arm or nearby decedent and/or tourniquet remained on).
    v. Multiple drugs often found in toxicology screens of fentanyl decedents.
    vi. High demand for heroin is key underlying cause, with prescription opioid prescribing practices being a major driving factor of increased heroin demand.

#### 4.6.2 Key themes noted across multiple Stakeholder groups

(1) The need for data sharing and coordination of efforts across organizational units (e.g. DEA, local law enforcement and ODH)
    i. Data sources that could be leveraged include criminal justice records, law enforcement (drug seizure) data, medical examiner/coroner reports, and the Ohio Disease Reporting system.
    ii. Need for a state-wide, electronic system for tabulating coroner and medical examiner data, enabling use of this data for public health surveillance purposes.
    iii. Improved coordination of efforts by harm reduction programs, including Naloxone distribution and Syringe services groups.

(2) Naloxone supply and administration concerns

i. Notable increases reported in the number of naloxone doses administered per overdose event, and the strain this places on resources. This is thought to be related to increases in heroin potency associated with the presence of illicit fentanyl.
ii. Rising costs of naloxone has impacted ability to maintain supplies. Various efforts underway to reduce the impact, such as negotiating for rebates with the manufacturer, and switching to lower cost intra-muscularly injected naloxone.

(3) Paucity of evidence-based addiction treatment services given the precipitous increase in demand—specifically medication-assisted treatment: buprenorphine, methadone and naltrexone—and the burden this places on law enforcement and jails/prisons as the *de facto* drug treatment of last resort.
   i. Treatment providers and public health strongly support increasing access to medication-assisted treatment (MAT), particularly buprenorphine due to its safer characteristics as a partial agonist. They report it as effective and cite growing requests from persons who struggle with addiction and their family members.
   ii. Law enforcement sometimes views medication-assisted treatment (MAT) as substituting one addiction for another. Long acting naltrexone (Vivitrol) is more accepted by law enforcement given the absence of psychoactive properties and no diversion potential. This approach is used in several treatment centers and drug courts.
   iii. Jails and prisons are acting as *de facto* treatment centers due to the high prevalence of people behind bars who are addicted to opioids, combined with a lack of treatment facilitates to stipulate treatment instead of jail.
(4) High prevalence of stigma and discrimination aimed at people struggling with the disease of addiction
   i. Illicit drug use viewed as criminal behavior of the destitute rather than a disease impacting all socioeconomic groups.
   ii. Stigmatization can impact syringe service programs and other evidenced-based harm reduction services, which are sometimes viewed as promoting, encouraging or condoning harmful behaviors.
   iii. Reluctance to utilize medication-assisted treatment (MAT) in addition to and in lieu of abstinence-based treatment modalities.

(5) Substantial changes in Ohio's drug markets over the last several years
   i. Increases in methamphetamine, synthetic drugs like Flakka and imitation cannabinoids, and non-pharmaceutical fentanyl, which is sold *mixed with heroin* and *alone* as 'blue drop' heroin.
   ii. Most common forms of heroin is 'white' and 'Mexican black tar' (both are base forms of the drug. Heroin in salt form (like the type found in the Northeast) is rare.
   iii. Heroin is easier to get than cannabis in some areas.

(6) People who use opioids (PWUO) are aware that fentanyl is both cut with heroin and sold alone as pure illicit fentanyl.
   i. Growing cohort of PWUO are actively seeking heroin cut with fentanyl because it is more potent, and a smaller number are pursuing pure NPF for the same reason.

(7) Concerns for infectious disease associated with injection drug use (IDU)
    i. Hepatitis C virus (HCV) infection is a growing issue among people who inject drugs (PWID) in Ohio.
    ii. Injection-related HIV infection is a growing concern for public health given the Indiana outbreak and Ohio cluster.
    iii. Bacterial-related infections are also a growing concern among PWID, particularly right-side endocarditis, and skin infections (necrotizing fasciitis; cellulitis).

**5.0 Summary of Key findings**

Below, key findings are summarized by investigation objective:

Objective 1: Characterize the population experiencing fentanyl-related overdose deaths, and compare it with the population experiencing heroin-related (exclusive of fentanyl) and prescription opioid overdose deaths.

- Overall, the population experiencing fentanyl-related overdose deaths did not vary greatly from the population experiencing heroin-related deaths on socio-demographic characteristics. These objective findings correlate well with qualitative sources (OSAM report; Key Stakeholder meetings) which indicate that illicitly made fentanyl is most often combined with heroin or sold as heroin without the knowledge of the person purchasing it.
- Both fentanyl-related and heroin-related overdose deaths were mostly male, white, and had some college or less education. These characteristics can serve to focus prevention efforts to those at highest risk.
- Approximately 62% all fentanyl and heroin decedents studied had a record of at least one opioid prescription from a healthcare provider during the seven years preceding their death, and these prescriptions often were dosed at levels which place one at high risk for addiction (>=90 morphine milligram equivalents). Specifically, 40% of fentanyl decedents and 33% of heroin decedents had a record of prescribed opioids with maximum dosing >= 90 MME. These findings are consistent with reports in the literature which have identified abuse of prescription opioids as the number one risk factor for transition to the use of heroin. More analysis is recommended to determine the timing and duration of the high dose prescriptions involved in this concerning finding.
- 1 in 10 people overdosing on heroin, and 1 in 5 people overdosing on fentanyl, had an active prescription for an opioid medication at the time of death. Understanding the prescription patterns of this group and other risk factors may enhance the ability of the medical community to identify and intervene.
- The distribution of heroin-related deaths was more concentrated in large metropolitan areas than fentanyl-related deaths. The highest rate of fentanyl-related deaths was found in moderate sized metropolitan areas in 2014.

- The population experiencing fentanyl-related overdose deaths were different than the population experiencing prescription opioid overdose deaths.
    - Compared to prescription opioid overdose deaths, the population experiencing fentanyl-related overdose deaths were younger, more likely to be male, and more likely to be single/never married.
    - Compared to prescription opioid overdose deaths, the population experiencing fentanyl-related overdose deaths were significantly more likely to have a current mental health problem and have recently been released from an institution.
    - Compared to prescription opioid overdose deaths, fentanyl-related overdose deaths were less likely to have a history of a benzodiazepine prescription.

Objective 2: Identify key risk factors for fentanyl-related overdose deaths that can be targeted by prevention activities.

- Risk factors for fentanyl-related overdose deaths included:
    - Male
    - White
    - Some college or less education
    - History of a substance abuse problem
    - Current diagnosed mental health condition(depression, anxiety, bipolar disorder)
    - Recent released from an institution within the last month (jail, hospital, treatment facility)
    - History of opioid prescription/misuse of opioid prescriptions
- These results are consistent with qualitative findings from several key stakeholders who noted a high prevalence of mental illness among illicit opioid users, as well as the high risk for opioid overdose among illicit opioid users who have recently been released from incarceration.

Objective 3: Provide epidemiologic and qualitative information that can aid the Ohio Department of Health in developing public health messages, response, and recommendations to health professionals, law enforcement, and populations at risk.

- Both fentanyl and heroin have had a broad impact across the state of Ohio, from large metropolitan areas to rural areas.
- The sharp increase in fentanyl-related deaths appears to be linked to mixing of illicitly manufactured fentanyl, or NPF, with heroin or selling of NPF as heroin. The influx of illicitly produced fentanyl into Ohio coincides closely with this sharp increase in fentanyl-related deaths, highlighting the importance of efforts aimed at curbing these supply chains.
- In 2014, residents in 60 of Ohio's 88 counties experienced at least a single fentanyl-related overdose
    - The vast majority of fentanyl-related deaths occurred in large metropolitan or moderately sized metropolitan areas. Two out of three fentanyl-related deaths occurred in 4 large metropolitan counties and 4 moderately sized metropolitan counties that had death rates ranging from 2.6 to 13.1 people per 100,000 people. This allows targeting of intervention at high burden areas that could substantially reduce deaths.

    - Some counties with above average heroin death rates are experiencing lower fentanyl-related deaths than other counties. These counties may be under-reporting fentanyl-related deaths, or may have effective prevention programs in place, or have not experienced as large of a change in fentanyl supply and use as other counties. Ongoing surveillance work with these counties is important to quickly identify new increases in fentanyl-related deaths or promising prevention practices.
    - NVDRS study counties and non-study counties experienced similar increases in heroin death rates from 2013 to 2014. This is concerning because increased heroin mortality may indicate increased use of heroin, which could make communities more vulnerable to fentanyl-related outbreaks.
- There is a high prevalence of stigma and discrimination aimed at people struggling with the disease of addiction making it a challenge to enhancing treatment support and engaging in harm reduction activities.

Objective 4: Assist in the identification of strategies to help the Ohio Department of Health monitor and prevent future fentanyl-related overdose deaths.

- Continue ongoing efforts to improve data sharing and coordination of prevention efforts across agencies, such as the utilization of OSAM findings within public health messaging created by the Ohio DOH.
- Continue to utilize NVDRS data to assess risk factors that can be targeted for prevention messaging and strategies.
- Continue to use non-fatal sources of data, such as EMS naloxone distribution and ED chief complaint data, to assist in surveillance of fentanyl morbidity and mortality.
- Utilize data on drug confiscations available from the DEA to assist in surveillance of fentanyl morbidity and mortality.
- Work to improve access to evidence-based addiction treatment services.

Preliminary findings were shared with the Ohio Department of Health during our EpiAid's exit meeting on Thursday, November 12, 2015. A summarized version of these were also shared with CDC colleagues during a 2-minute update during CDC's Tuesday Morning Seminar on January 4, 2016.

**6.0 Recommendations**

Recommendations from the field investigation include:

**Public Health Surveillance**

- Continue to carefully monitor fentanyl-related mortality in high opioid overdose burden counties, as well as in those counties with a combination of high heroin-related mortality and low rate of fentanyl-related mortality.
- Establish a process to review data on heroin, fentanyl, and prescription opioid-related overdoses at least twice a year from multiple sources on an ongoing basis in order to identify new patterns.
- Support continued testing for fentanyl by coroners and medical examiners, especially in suspected opioid-related overdoses.
- Consider the following enhancement to current surveillance, as resources permit.

- Establish meetings with OSAM to review findings from their interviews of drug users as they become available and integrate this with ongoing morbidity and mortality surveillance.
- Due to the strong relationship between fentanyl-related seizures and fatal fentanyl-related overdoses, Ohio should work to secure state-level fentanyl-related seizure data and investigate the feasibility and utility of getting local drug seizure data from labs serving Ohio.
- Implement enhanced real-time surveillance of heroin-related ED visits using ED chief complaints at the state level to better track morbidity related to drug overdoses and heroin overdoses and get early warning for possible state-level spikes.
    - Real-time data should be aggregated by month and quarter to detect gradual increases over time as well as sharp increases occurring over shorter time periods.
    - As real-time surveillance of drug and heroin overdose in real-time is new in Ohio, the criterion for what constitutes an outbreak should be conservative to ensure the judicious use of resources and be adjusted based on experience.
    - The following types of outbreaks should be prioritized for response:
        - Sharp increases observed across multiple hospitals or large hospitals serving large patient populations; and
        - Sharp increases that are sustained over the course of weeks and months.
    - More investigation is needed to determine the extent to which trends at the local and hospital level are captured by this definition.
    - Consider establishing a sentinel surveillance system in hospitals that submit both chief complaint and triage notes. Additional information from triage notes should provide more sensitive tracking of heroin-related ED visits.
- Track number of naloxone administrations and multiple administrations by county to identify counties with large changes in opioid-related overdoses and predict need for naloxone. Because nearly 1 in 4 patients administered naloxone by EMS receive two or more dosages, tracking multiple administrations is critical to understand the need for naloxone by first responders.
- Efforts should be made to improve drug overdose reporting in the 5 large counties that reported specific drug(s) causing overdoses in less than 90% of drug overdose cases.
- To track and better understand the risk factors driving fentanyl-related overdoses, continue collecting NVDRS data on fentanyl-related deaths in a subset of high burden counties, including some suburban and rural counties where rates of fentanyl-related overdose are high.
    - Continue analyses of NVDRS data collected as part of the Epi-Aid to identify risk factors that are highly prevalent in each of the 14 study counties.

**Targeting of public health response to high-burden counties and high risk groups**

- Consider targeting interventions at the 8 high burden counties that accounted for around 2 out of 3 fentanyl-related overdoses in 2014 (see Appendix 1), as well as those suburban and rural counties where the rate of fentanyl-related overdose is high.

- Consider targeting interventions in those counties where certain risk factors are disproportionately evident, such as counties with a high rate of fentanyl overdose among persons recently released from an institution.
    - This is especially important in Montgomery and Cuyahoga counties, where approximately 1 in 4 fentanyl-related deaths involved people recently released from an institution.
    - Identify the types of institutions from which decedents are being discharged to inform interventions.
    - Support treatment during incarceration and assist people with transitioning substance abuse treatment on release.
- The high percent of decedents with mental health problems may provide an opportunity to detect and provide substance abuse treatment to at-risk individuals.

**Facilitate and enhance EMS response to fentanyl-related overdose**

- Work with public health agencies to help ensure the availability and widespread use of Naloxone by all EMS responders, particularly in counties hardest hit by the current epidemic.
- Ensure first responders are trained in multiple naloxone administrations due to the high potency of fentanyl. Public health messaging to EMS can note that fentanyl is unique from other opioids in its extreme rapid onset of action, and high potency. Can also note that 1 in 4 patients were administered naloxone 2 or more times by EMS responders during this ongoing epidemic.
- Ensure first responders understand the importance of implementing standard first aid in opioid overdoses, such as rescue breathing and CPR, as 1 or 2 naloxone dosages may be insufficient to reverse some fentanyl-related overdose, and further life support becomes imperative.
- Conduct a more in-depth analysis of the over 4 in 10 fentanyl-related deaths where naloxone was administered and the patient died to identify new opportunities for intervention.

**Facilitate and enhance layperson response to fentanyl-related overdose**

- Because bystanders were present in the majority of fatal fentanyl-related overdoses, several response efforts are indicated:
    - Raise public education and awareness of fentanyl-related overdoses by:
        - Improving recognition of potentially overlooked signs of opioid overdose by laypersons, such as excessive or uncharacteristic snoring.
        - Increasing awareness among laypersons that fentanyl onset of action is extremely rapid and extremely potent, and that EMS activation should not be delayed, even if naloxone has been administered (i.e., call 911).
        - Emphasize the high potency of fentanyl to both lay people and first responders. Stress that reversal may require multiple naloxone dosing or only be achieved in an emergency department.
        - Example links to some public education campaigns are provided in *Section 7.0: Messaging Resources*
    - Consider means for expanded access and use of naloxone to community members and first responders when feasible, including potential liability protections for community people administering naloxone.

- Consider means to reduce barriers to members of the community calling 9-1-1 to report an overdose such as recognition of an overdose, Good Samaritan laws (i.e., fear of arrest if a person calls) and stigma around opioid use disorder.

- Prevention messaging can include general warnings of presence of highly potent fentanyl in some batches of heroin in Ohio. Warning should be coordinated with the harm reduction community and take into account that some people misusing opioids may seek out potent batches noted in warnings.
- Ohio DOH identified the need for CDC to develop effective communications messages targeting the public and people abusing opioids that can be deployed in response to sharply increasing rate of fentanyl deaths. Currently, public health alerts around fentanyl should refer to large geographic areas in order to reduce the chance people seeking more potent opioids will seek out fentanyl-laced heroin.

**Improved prescribing practices for OPRs and referral of patients abusing opioids to treatment**

- Due to the preliminary findings that approximately 1 in 10 heroin and 1 in 5 fentanyl overdose decedents were prescribed opioid pain relievers at the time of death, explore opportunities to assist clinicians in identifying patients abusing opioids and referring them to evidence-based substance abuse treatment (usually medication-assisted treatment with buprenorphine or methadone, in combination with behavioral therapies).
- This study has found that the vast majority of fentanyl and heroin overdose decedents had received opioid pain relievers in the past and often at high dosages. Abuse of opioid pain relievers is the strongest risk factor for initiating and using heroin, and this finding highlights the need to redouble efforts to ensure appropriate prescribing of opioid pain relievers, and refer people abusing opioid pain relievers to evidence-based substance abuse treatment.
    - Because a significant percent of people dying from fentanyl and heroin overdoses had previously been prescribed opioid pain relievers, more work is needed to identify high risk prescribing patterns associated with types of overdoses and identify opportunities for early intervention.

**Work to reduced stigma around substance abuse and substance abuse treatment**

- Educate the public that substance abuse is an illness and not a flaw of character.
- Educate the public about the effectiveness of treatment options such as MAT.

**Integrated Prevention services**

- Ensure that people have access to integrated prevention services, including access to sterile injection equipment from a reliable source, as allowed by local policy.

**7.0 Messaging Resources**

The following are examples of prevention messaging focused on fentanyl-laced heroin.

- NYC Department of Health and Mental Hygiene letter (Feb., 2014) "Cases of fentanyl-associated overdoses in Mid-Atlantic and Northeast United States" accessible at https://a816-health30ssl.nyc.gov/sites/NYCHAN/Lists/AlertUpdateAdvisoryDocuments/Fentanyl-advisory-feb2014-HAN-feb6-final.pdf

- Vancouver Harm Reduction group (Insite) messaging on fentanyl-laced heroin, article available at http://www.cbc.ca/news/canada/british-columbia/fentanyl-warnings-posted-by-insite-in-vancouver-s-downtown-eastside-1.3186322
- British Columbia Health groups joint messaging on dangers of fentanyl-laced heroin: http://knowyoursource.ca/

**8.0 Future Plans**

Data analyses are ongoing. Findings will help the Ohio Department of Health target educational messages and focus on at-risk populations.

In collaboration with the Ohio Department of Health, findings will be disseminated via an MMWR, peer-reviewed publications, and/or professional presentations.

**References**

1. Poklis A. Fentanyl: A Review for Clinical and Analytical Toxicologists. *Journal of Toxicology and Clinical Toxicology*. 1995;33: 439-447.

2. Algren DA, Monteilh CP, Punja M, Schier JG, Belson M, Hepler BR, Schmidt CJ, Miller CE, Patel M, Paulozzi LJ, Straetemans M, Rubin C. Fentanyl=Associated Fatalities Among Illicit Drug Users in Wayne County, Michigan (July 2005-May 2006). Journal of Medical Toxicology. 2013; 9: 106-115.

3. Centers for Disease Control and Prevention. Nonpharmaceutical fentanyl-related deaths— multiple states, April 2005-March 2007. *Morbidity and Mortality Weekly Report*. 2008 Jul 25;57(29):793-6.

4. US Department of Justice, Drug Enforcement Administration. Nationwide Alert on Fentanyl as Threat to Health and Public Safety. 2015. Accessed October 8, 2015 from http://www.dea.gov/divisions/hq/2015/hq031815.shtml.

5 US Department of Justice, Drug Enforcement Administration. National Heroin Threat Assessment Summary [DEA-DCT-DIR-039-15]. April 2015. Accessed October 8, 2015 from http://www.dea.gov/divisions/hq/2015/hq052215_National_Heroin_Threat_Assessment_Summary.pdf.

6. Centers for Disease Control and Prevention. Nonpharmaceutical fentanyl-related deaths— multiple states, April 2005-March 2007. *Morbidity and Mortality Weekly Report*. 2008 Jul 25;57(29):793-6.

7. Hempstead K, Yildirim EO. Supply-Side Response to Declining Heroin Purity: Fentanyl Overdose Episode in New Jersey. Health economics. 2013 Jun 6.

8. Hull MJ, Juhascik M, Mazur F, Flomenbaum MA, Behonick GS. Fatalities associated with fentanyl and co-administered cocaine or opiates. Journal of forensic sciences. 2007 Nov;52(6):1383-8.

9. Denton JS, Donoghue ER, McReynolds J, Kalelkar MB. An epidemic of illicit fentanyl deaths in Cook County, Illinois: September 2005 through April 2007. Journal of forensic sciences. 2008 Mar;53(2):452-4.

10. Centers for Disease C, Prevention. Acetyl fentanyl overdose fatalities--Rhode Island, March-May 2013. MMWR Morbidity and mortality weekly report. 2013 Aug 30;62(34):703-4.

11. Centers for Disease Control and Prevention. Notes from the field: Acetyl fentanyl overdose fatalities - Rhode Island, March-May 2013. MMWR: Morbidity & Mortality Weekly Report http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6324a3.htm

12. Ohio Dept. of Public Health, 2014 Ohio Drug Overdose Preliminary Data: General Findings. 2015 Accessed October 9, 2015 http://www.dispatch.com/content/downloads/2015/09/2014_Ohio_Preliminary_Overdose_Report.pdf

**Appendix 1: Summary of number of Fentanyl-related overdose fatalities by County, 2014**

| County Name | 14 NVDRS Study Counties? | Number of Fatal Fentanyl-related Overdoses |
|---|---|---|
| HAMILTON | YES | 80 |
| MONTGOMERY | YES | 70 |
| SUMMIT | YES | 58 |
| BUTLER | YES | 49 |
| CUYAHOGA | YES | 33 |
| CLERMONT | YES | 22 |
| STARK | YES | 21 |
| LUCAS | YES | 20 |
| LORAIN | NO | 15 |
| FRANKLIN | NO | 13 |
| WARREN | YES | 10 |
| GREENE | NO | 9 |
| CLARK | YES | 8 |
| MEDINA | NO | 8 |
| MAHONING | NO | 7 |
| MIAMI | YES | 7 |
| SCIOTO | YES | 7 |
| DARKE | NO | 6 |
| FAYETTE | YES | 6 |
| ROSS | YES | 5 |
| 40 COUNTIES WITH 1 TO 4 OVERDOSES | NO | 72 |

**Appendix 2: List of National Violent Death Reporting System variables utilized for this investigation**

| **Incident Information** | **Victim Information** |
|---|---|
| Date of addition/change | County of residence |
| Version of software | City of residence |
| Incident type | Zip code of residence |
| Case status | US Census block group of residence |
| Number of source documents in incident | US Census tract of residence |
| Number of persons in incident | Birth place |
| Number of weapons in incident | Country of birth if not listed |
| Date supervisor checked incident | Ever served in US armed forces (veteran) |
| Date supervisor rechecked incident | Marital status |
| Supervisor note field | Place of death |
| Number of non-fatally shot persons in incident | Place of death if other |
| Narrative of the incident | Date pronounced dead |
| | Date of death |
| | State of death |
| **Document notes** | Immediate cause of death text |
| Document type | Cause leading to immediate cause text |
| Person who entered record | Next antecedent cause of death text |
| Source agency requested from | Underlying cause of death text |
| Date record requested/expected/sought | Underlying cause of death ICD-10 code |
| Date record re-requested/re-searched | ICD10 4th (character) |
| Date record received | ICD10 5th (character) |
| Date record abstracted/imported | Autopsy performed |
| Date entered data checked | Person was pregnant |
| Document determined to be unavailable | Manner of death |
| Document notes field | Date of injury |
| | Time of injury |
| **Person Information (Victim)** | Type of location where injured |
| Abstractor Assigned Manner of death | Injured at work |
| Person type | State of injury FIPS code |
| Age | County of injury |
| Age unit | City of injury FIPS code |
| Sex | US Census block group of injury |
| White | US Census tract of injury |
| Black | Survival time no. of units |
| Asian | Unit of time used in survival time |
| Native Hawaiian or Pacific Islander | Education |
| American Indian | Number years of education |
| Other Race | Usual occupation code |
| Unspecified Race | Usual occupation text |
| Hispanic/Latino/Spanish | Kind of business/industry code |
| Country of residence | Usual industry text |
| State of residence | Multiple conditions on death certificate 1-10 |
| | Height |
| | Weight |
| | Transgender |
| | Sexual orientation |
| | Recent release from an institution |

*Coroner/Medical Examiner*
ZIP code of injury
At person's home
EMS at scene
Homeless status
Current occupation
Victim in custody when injured

*Toxicology*
Alcohol use suspected
Date specimens were collected
Time specimens were collected
Name of poison
Type of poison *(Automatically generated)*
Code for poison *(Automatically generated)*
Patient drug obtained for
Cause of death *Summary Toxicology*
Testing for alcohol
Alcohol test results
Blood alcohol concentration results
Testing for amphetamines
Amphetamine test results
Testing for antidepressants
Antidepressant test results
Testing for cocaine
Cocaine test results
Testing for marijuana
Marijuana test results
Testing for opiate(s)
Opiate test results
Testing for anticonvulsants
Anticonvulsants test results
Testing for antipsychotic
Antipsychotic test results
Testing for barbiturates
Barbiturates test results
Testing for benzodiazepines
Benzodiazepines test results
Testing for muscle relaxants
Muscle relaxants test result
Testing for carbon monoxide
Carbon monoxide results
Carbon monoxide source, if CO
Toxicology Comment

**Type of Drug Poisoning**
Type of Drug Poisoning

**Substance Abuse**
Previous drug overdose
Treatment for substance abuse
History of opioid/heroin abuse
Scene indications of drug abuse

**Prescription Information**
Use of prescription morphine
Number of opioid prescriptions in 30 days preceding injury
Number of pharmacies dispensing opioids to decedent in 180 days preceding injury
Number of doctors writing opioid prescriptions to the decedent in the 180 days preceding injury

**Response to Drug Overdose**
Naloxone/Opioid antagonist administered
Bystanders present at time of overdose

**Other**
Route of drug exposure
Treated for pain at time of injury

## Appendix 3: List of OARRS (Ohio Automated Prescription Reporting System) variables utilized for this field investigation

**Prescription**

- Prescriber
- Dispensing Pharmacy
- Patient
- Drug
- Date Written
- Date Filled
- Quantity Dispensed
- Days Supply (as calculated by pharmacist)
- Number of Refills Authorized
- Refill Number
- Method of Payment

**Prescriber**

- DEA Number
- *Name*
- *Address (as registered with DEA)*

**Pharmacy**

- DEA Number
- *Name*
- *Address*
- *Phone Number*

**Patient**

- Name
- Date of Birth
- Address
- Phone Number
- Gender

**Drug**

- NDC Number
- *Product Name*
- *Product Strength*
- *Form (tablet, syrup, etc.)*
- *Therapeutic Class*
- *Morphine Equivalent*

**Additional OARRS Data Elements**

- # of Prescribers in 12 months prior to death
- MED at death
- Max MED all time
- Doctor Shopper Indicator 2007 – 2014 (by year)
- Max MED in 30 days prior to death
- Date of Last Opioid Rx
- Date of First Opioid Rx
- Date of First Benzo Rx
- Date of Last Benzo Rx
- Max # of Prescribers in any calendar month
- Max # of Prescribers in any calendar quarter
- Max # of Prescribers in any calendar year
- Max # of Pharmacies in any calendar month
- Max # of Pharmacies in any calendar quarter
- Max # of Pharmacies in any calendar year