

Drug and Opioid Epidemic Report

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"Working to enhance our community's total well-being"

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Drug overdose is a serious public health problem that now constitutes the leading cause of injury death in the United States.¹ In fact, overall life expectancy in the United States decreased for a second consecutive year in 2016, largely due to younger people dying of drug overdose. Opioid abuse and misuse continues to drive the drug overdose epidemic. Calhoun County, like other communities in the United States, is also affected by the epidemic. This document provides a snapshot of the opioid epidemic in Calhoun County and briefly outlines a framework to address it from a public health perspective.

An **opioid** is a drug that eases pain and may also cause feelings of extreme pleasure. Opioids act on the brain and nerves and include both prescription medications and illegal drugs like heroin. Opioids can be addictive with regular use or misuse. An **opioid overdose** occurs when excess opioids act on the brain to decrease or stop a person's breathing. **Opioid dependence** occurs when the brain adapts and only functions normally when opioids are present; when opioids are not present, a reaction known as withdrawal occurs. **Opioid addiction** is a long-term, relapsing disease of the brain characterized by compulsive drug seeking and use despite harmful consequences.² Opioid addiction affects not only the lives of addicted individuals but families and communities as well. It is possible to be opioid dependent without being addicted since dependence and addiction occur within different parts of the brain.

Like most public health challenges, the opioid epidemic's origins are multifactorial. First, an increase in supply of both prescription opioids and illicit opioids increased the risk for overdose in the population. With respect to prescription opioids, long term treatment with opioids, often for chronic pain, led to people spending more time at risk for overdose. In other words, both increased exposure and increased exposure duration to prescription opioids contributed to an increased risk of overdose. The misperception of opioids being low-risk medications for developing dependence or addiction also contributed to the rationalization of increased prescription opioid supply and the outcome of overdose. It is now well established that prescription opioids can be addictive with regular use or misuse. With respect to illicit opioids, increased potency of heroin and fentanyl made it much easier for a person to overdose as well. For persons who develop opioid dependence or addiction, fragmented systems of care between substance use treatment providers, healthcare systems, behavioral and mental health services, insurance providers and social services continues to hinder access and coordination of treatment. Finally, the perception of addiction as a moral defect continues to be counterproductive,³ because research, resources, interventions and treatment are then not aligned to address addiction for what it really is – a long-term, relapsing disease of the brain that has profound implications for families and communities.

The opioid epidemic can be quantified in several ways including fatal and nonfatal overdoses, the frequency of opioid overdose reversals with naloxone administration, substance abuse service utilization, law enforcement records, opioid prescription rates, behavioral risk factor surveys, rates of newborn opioid withdrawal, the incidence of drug-related infectious diseases, and personal testimony from community members. This report highlights the burden of opioid prescriptions, as well as fatal and nonfatal opioid-related overdoses in Calhoun County, Michigan.

¹Centers for Disease Control and Prevention

²The National Institute on Drug Abuse

³The United States Surgeon General

Opioid Prescriptions

From 2010 to 2015, the amount and strength of opioids prescribed in Calhoun County increased significantly while the national average decreased. In 2015, the amount and strength of opioids prescribed was nearly double the national average and six times higher than the 1999 national average. In 2016, 120 opioid prescriptions per 100 persons were dispensed, nearly twice the national average.

Emergency Department Opioid-Related Overdoses

Although opioid overdose visits comprise a very small proportion of all Calhoun County emergency department visits, opioid overdose visits nearly doubled from 147 to 289 visits between 2015-2017. More than half of these opioid overdoses occurred in the combined age groups of 25-34 and 35-44 years. Nearly two times the number of males presented for a “heroin” overdose than females in 2017. Visits coded as “heroin” nearly tripled for males between 2015-2017. Overdose visits coded as “heroin” nearly doubled for females from 2016 to 2017. In 2017, the top three zip codes with the highest rates of opioid overdose visits to an emergency department in Calhoun County were 49037, 49017, and 49014.

Opioid-Related Deaths

The 2016 crude, total opioid-related death rate of approximately 30 deaths per 100,000 Calhoun County residents was 1.72 times higher than the Michigan 2016 crude death rate of 17.5 deaths per 100,000 residents. More than 40 opioid-related deaths have occurred each year in Calhoun County between 2015-2017. In 2017, the average age of a person who died of an accidental or indeterminate opioid-related death was 40 years. An additional 1,418 years of life would have been lived if Calhoun County residents who died of an accidental or indeterminate opioid-related death in 2017 had not died prematurely. More people die of drug-related overdose in Calhoun County than of motor vehicle accidents.

The Fentanyl Epidemic

Fentanyl-related deaths in Calhoun County increased from 6 in 2015 to 31 (27 Calhoun residents) in 2017. In January 2017, an outbreak of 8 fentanyl-related deaths (7 Calhoun residents) occurred over a period of 23 days. Illicitly manufactured fentanyl poses a serious public health threat to Calhoun County.

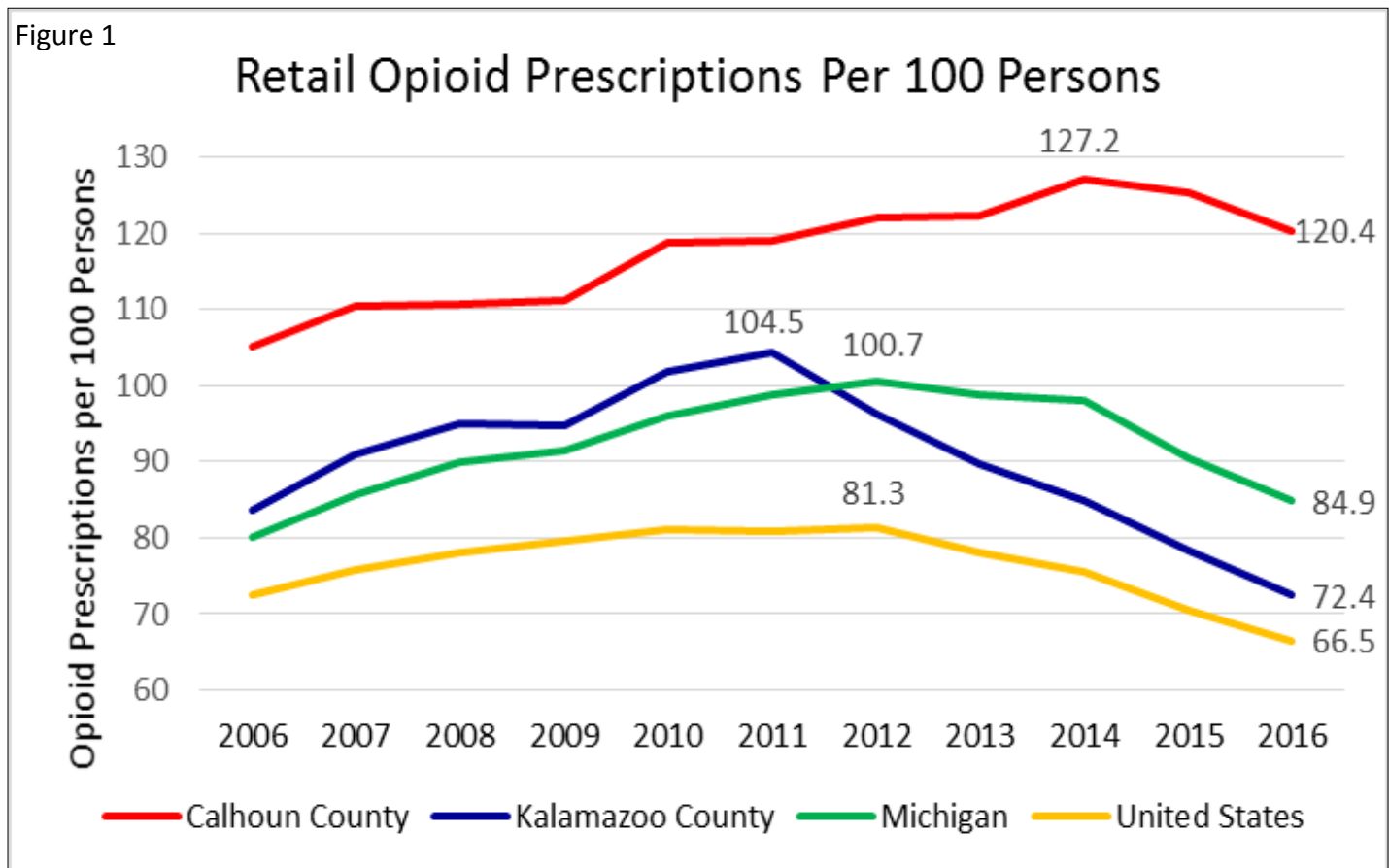
Future Steps

A multi-sector, collaborative approach across communities is required to confront the opioid epidemic. Key strategic priorities include prevention and education, supply and control of opioids, treatment access across a continuum of care and the reduction of fatal overdoses and the spread of infectious disease through harm reduction efforts. The Calhoun County Opioid Coalition aims to address the opioid epidemic through the coordination and integration of these four strategic priorities.

Please refer to the data sources, limitations, and definitions in this report for a more complete interpretation of these key points.

The correlation between opioid prescribing practices and the current opioid epidemic has been well established. Figure 1 describes the number of opioid prescriptions dispensed at a retail pharmacy per 100 persons in Calhoun County, Kalamazoo County, the State of Michigan, and the United States from 2006 to 2016. Calhoun County opioid prescriptions peaked at 127.2 per 100 persons in 2014. Michigan and United States opioid prescriptions peaked in 2012, at 100.7 and 81.3 per 100 persons respectively. In 2016, Calhoun County had nearly twice the rate of retail opioid prescriptions than the United States average. Of note, these data only report the number of prescriptions, but do not capture the strength or amount of opioids dispensed. Figure 1 does not capture any potential change in opioid prescribing trends after 2016.

Figure 1



Data Definitions:

Retail outlets include commercial pharmacies but do not include locations like emergency departments or substance abuse treatment clinics. It does not include mail order pharmacy data.

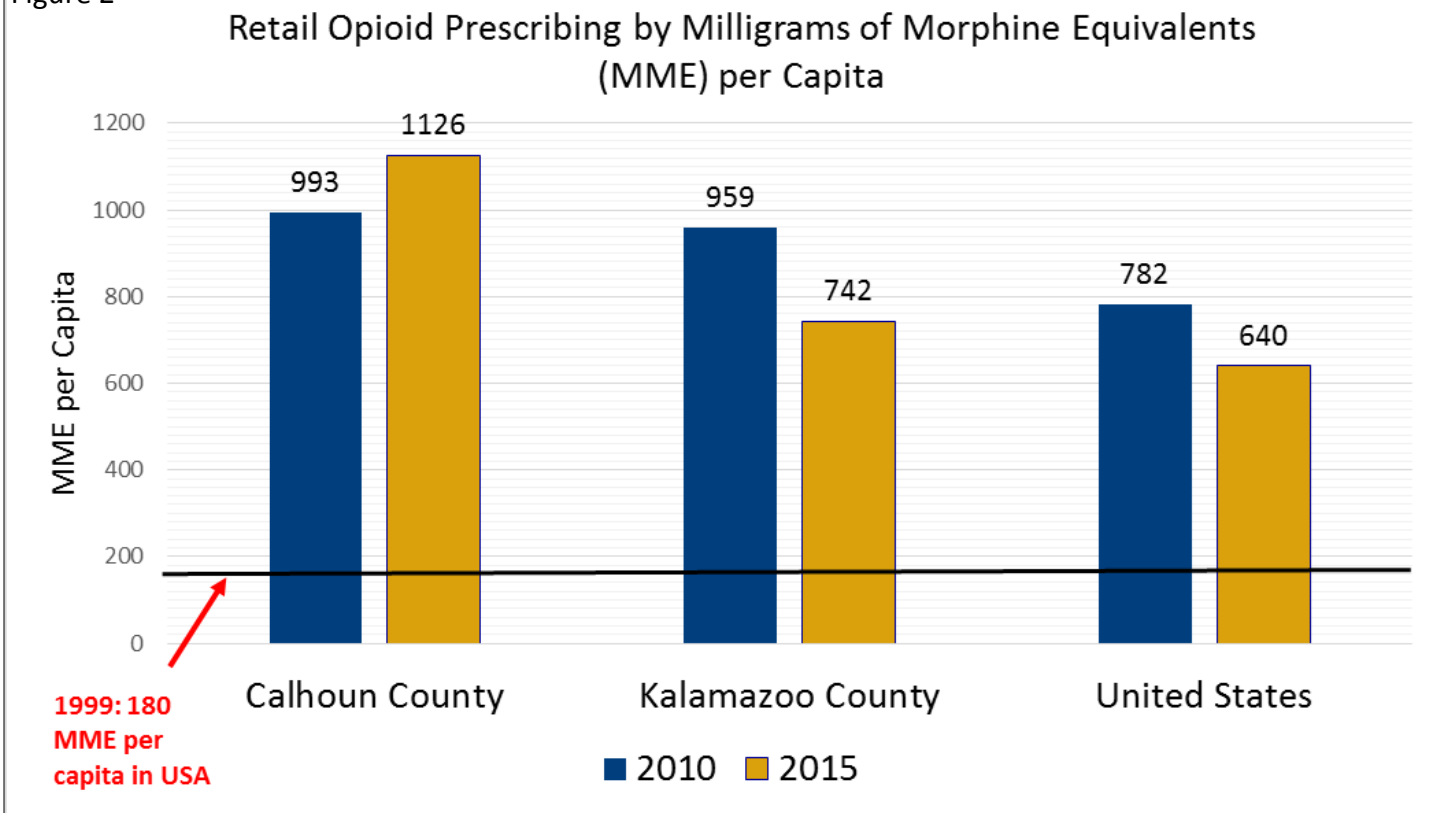
Opioid prescriptions do not include cough/cold medications, buprenorphine or methadone dispensed through a substance abuse treatment program in this data set.

Resident population annual denominator estimates were obtained from the Population Estimates Program, U.S. Census Bureau.

Source: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Unintentional Injury Prevention. <https://www.cdc.gov/drugoverdose/maps/rxrate-maps.html>.

Another way to examine the burden of opioid prescriptions is to account for the strengths and dosages of the opioids dispensed. **Milligrams of morphine equivalents (MME)** are a way to standardize and compare opioids of different strengths and dosages. MMEs add specificity to opioid prescription supply descriptions in addition to pill count or number of prescriptions alone. Figure 2 describes these MMEs per capita, or per person, residing in Calhoun County, Kalamazoo County or the United States. Nationally, from 2010 to 2015, the amount of opioids prescribed decreased 18% from 782 MME per capita to 640 MME per capita. Calhoun County did not follow the national trend, as retail prescriptions increased 13% from 993 to 1126 MME per capita. In 2015, Calhoun County was in the highest quartile of MME per capita among US counties and was 6.25 times higher than the 1999 national average of 180 MME per capita—a time near the beginning of the opioid overdose epidemic.

Figure 2

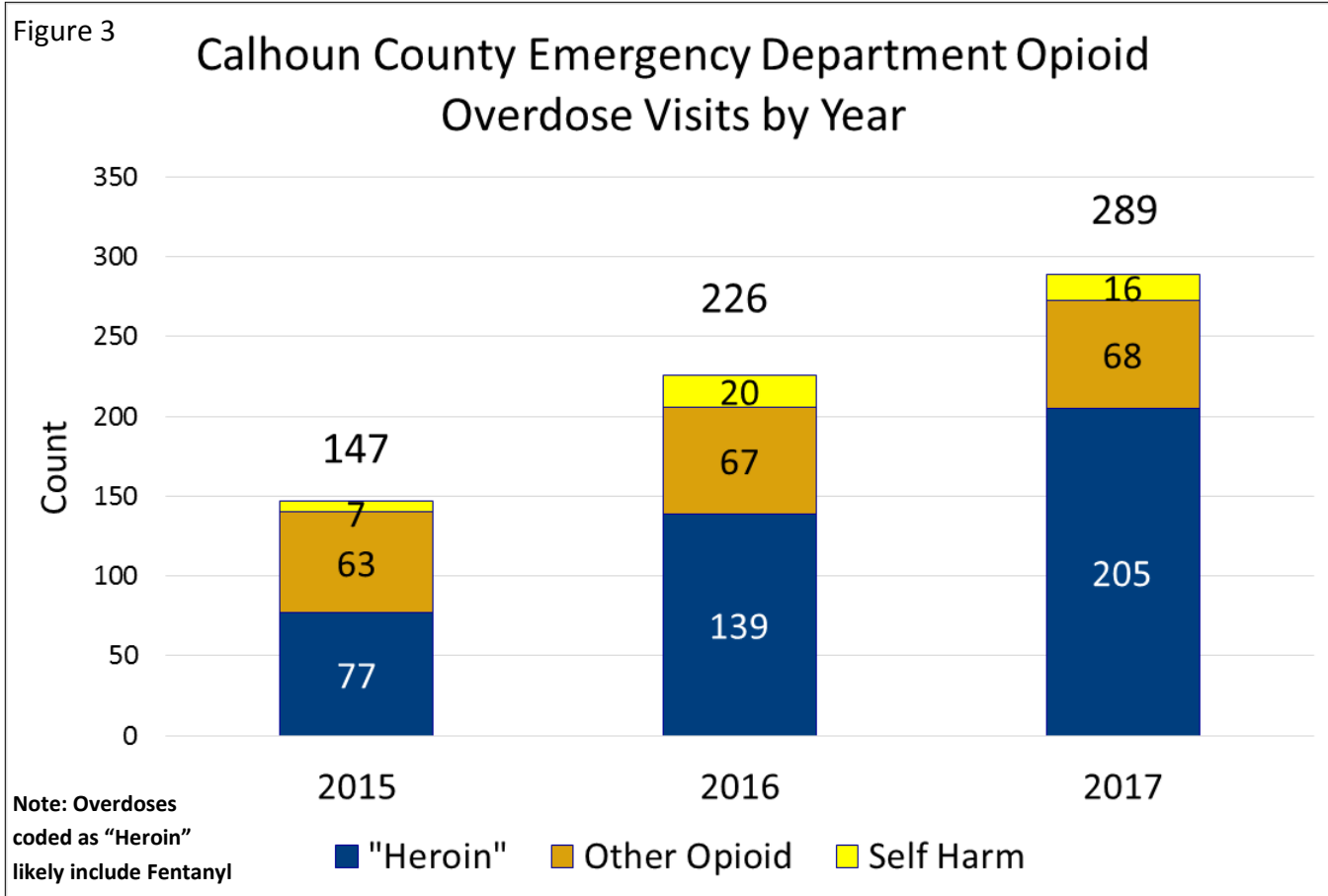


Data Definitions/Limitations: Figure 2 does not capture any changes in prescribing that may have occurred after 2015.

Retail outlets include commercial pharmacies but do not include locations like emergency departments or substance abuse treatment clinics.

Source: Guy GP Jr., Zhang K, Bohm MK, et al. Vital Signs: Changes in Opioid Prescribing in the United States, 2006–2015. MMWR Morb Mortal Wkly Rep 2017;66:697–704.

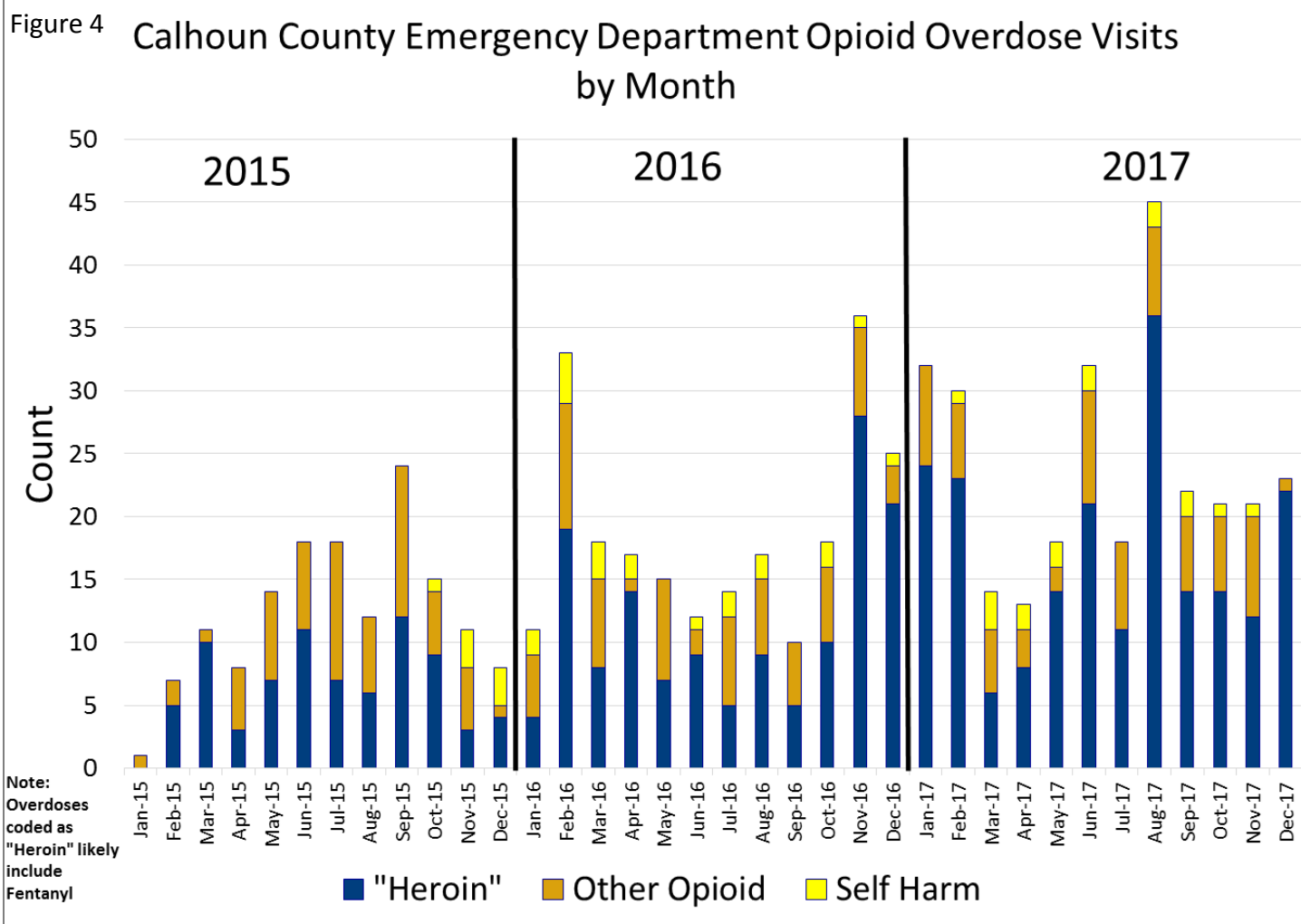
Figure 3 illustrates the number of opioid overdoses that present to an emergency department located within Calhoun County from 2015 to 2017. The total number of opioid overdoses increased each year to a total of 289 overdoses in 2017. Overdoses coded as an opioid other than heroin remained steady each year. Conversely, overdoses coded as “heroin” increased 266% from 77 in 2015 to 205 in 2017. Despite this significant increase, the 226 opioid overdoses in 2016 accounted for 0.27% of the 82,301 emergency department visits that occurred in Calhoun County.



Data Limitations/Definitions: Not all opioid overdoses present to the emergency department. To be counted, a case must arrive at an emergency department in Calhoun County and be coded by a physician, provider or biller as an opioid-related overdose. These data encompass ICD-9/10 poisoning codes selected by Calhoun County Public Health Department (CCPHD) to best capture an opioid overdose. A specifications sheet ensured standardized reporting across two hospitals with different electronic health record systems. In October 2015, diagnostic coding updated to ICD-10, enabling more specific coding and also intent designations of an overdose as unintentional, undetermined and self harm. “Heroin” and other opioid categories include unintentional and undetermined overdoses. The self harm category includes both heroin and other opioid poisoning codes with intent of suicide or self harm. Since visit coding is based mostly on history and physical exam and not toxicology, overdoses coded as heroin-related in the emergency department likely include fentanyl-related overdoses. The same individual can have multiple visits.

Source: Bronson Battle Creek Hospital and Oaklawn Hospital

Figure 4 illustrates the number of opioid overdoses that presents to an emergency department located within Calhoun County by month from 2015 to 2017. Months with 25 overdoses or greater include February 2016, November 2016, December 2016, January 2017, February 2017, June 2017 and August 2017. Of note, visits coded as an opioid other than heroin have low variance by month. However, "heroin" coded visits demonstrate higher variance. This observation likely correlates to the variable potency of heroin and fentanyl present in Calhoun County at a given time.



Data Limitations/Definitions: Not all opioid overdoses present to the emergency department. To be counted, a case must arrive at an emergency department in Calhoun County and be coded by a physician, provider or biller as an opioid-related overdose. These data encompass ICD-9/10 poisoning codes selected by CCPHD to best capture an opioid overdose. In October 2015, diagnostic coding updated to ICD-10, enabling more specific coding. Therefore, 2015 includes both ICD-9/10 codes and likely undercounts intentional self harm visits. Since visit coding is based mostly on history and physical exam and not toxicology, overdoses coded as heroin-related in the emergency department likely include fentanyl-related overdoses. The same individual can have multiple visits.

Source: Bronson Battle Creek Hospital and Oaklawn Hospital

Emergency department visits for unintentional and undetermined* opioid overdose increased in all age groups above 15 years except those aged 65+ years, with the largest number and increase occurring among those aged 25-34 years between 2015-2017.

More than half of the opioid overdoses that present to a Calhoun County emergency department occur in the combined age groups of 25-34 and 35-44 years.

Nearly two times the number of males presented to the emergency department for a "heroin" overdose than females in 2017.

Emergency department visits coded for an opioid overdose other than heroin did not differ between males and females between 2015-2017.

However, visits coded as "heroin" nearly tripled for males between 2015-2017. Overdose visits coded as "heroin" nearly doubled for females from 2016 to 2017.

Of the 626 emergency department visits for an unintentional and undetermined* opioid overdose between 2015-2017, 81% (506 visits) were a Calhoun County resident by zip code status.

*Figures 5 and 6 do not include self harm visits for 2016 and 2017.

Figure 5 Calhoun County Opioid Overdose Emergency Department Visits by Year and Age

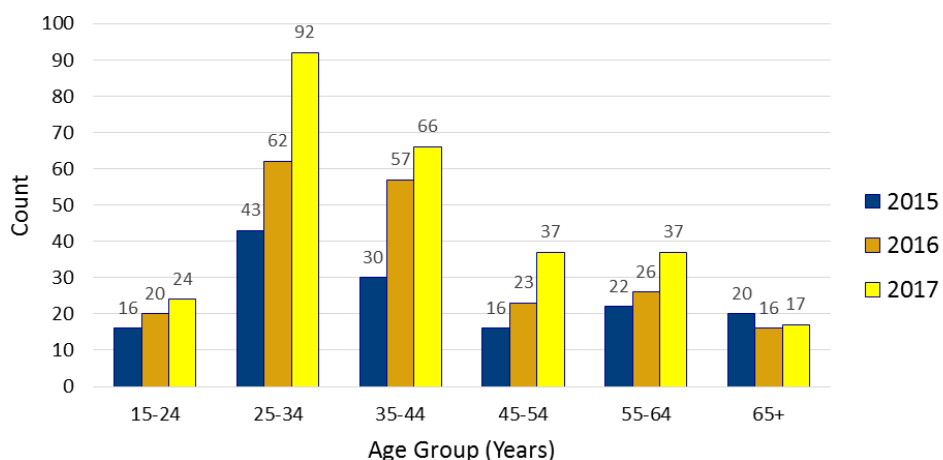
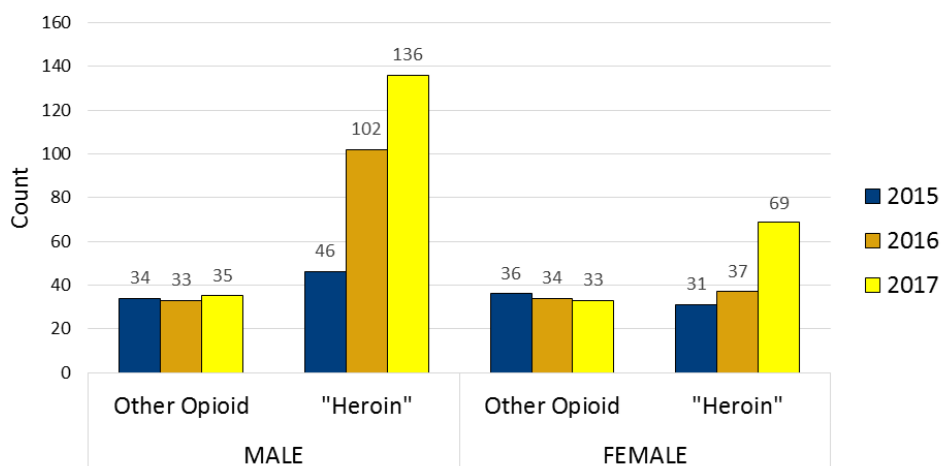


Figure 6 Calhoun County Opioid Overdose Emergency Department Visits by Opioid, Sex and Year



Data Limitations/Definitions: Not all opioid overdoses present to the emergency department. To be counted, a case must arrive at an emergency department in Calhoun County and be coded by a physician, provider or biller as an opioid-related overdose. These data encompass ICD-9/10 poisoning codes selected by CCPHD to best capture an opioid overdose. Since visit coding is based mostly on history and physical exam and not toxicology, overdoses coded as "heroin" in the emergency department likely include fentanyl-related overdoses.

1999-2016 Opioid-Related Vital Statistics

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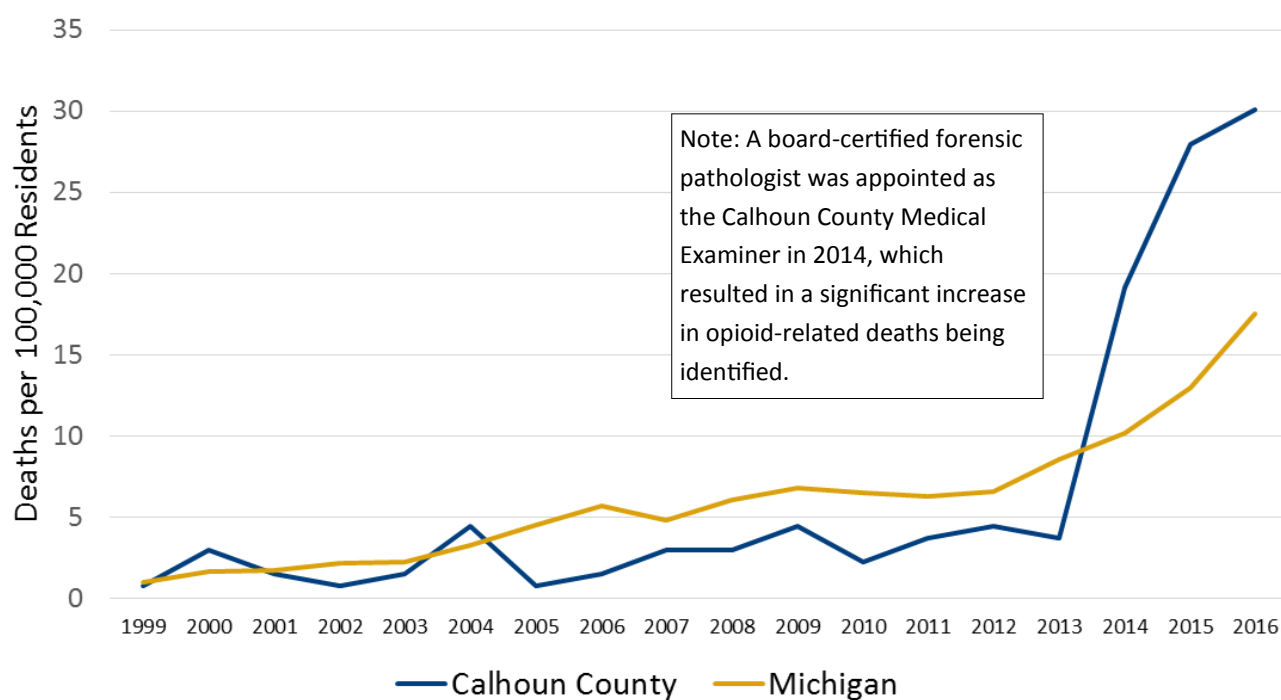
Vital statistics include events such as births or deaths that occur in residents of a particular geographic area, most often regardless of where the event occurred. Unlike medical examiner data, vital statistics for drug-related deaths are recorded by county of residence rather than the location of death. Documenting events by county or state of residence enables public health program planning and comparison across counties, states, and nations. Calhoun County's 2016 crude total opioid-related death rate of approximately 30 deaths per 100,000 residents was 1.72 times higher than Michigan's 2016 crude rate of 17.5 deaths per 100,000 residents.

Table 1: Vital Statistics for Calhoun County Opioid Deaths by All Manners of Death*

Yr	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
#	1	4	2	1	2	6	1	2	4	4	6	3	5	6	5	26	38	41

Figure 7

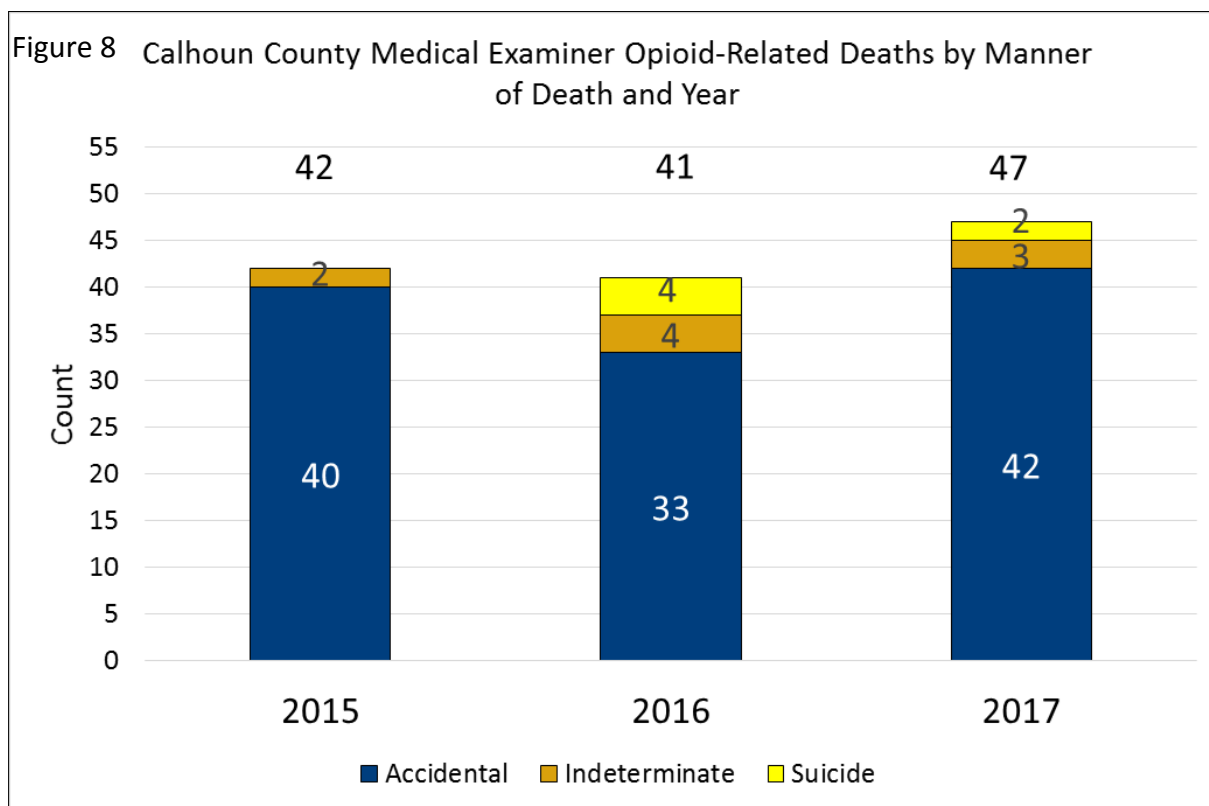
Total Opioid-Related Crude Death Rate



Data Limitations/Definitions: Vital statistics are recorded by county of residence, not location of death. The rates of this graph are not adjusted for age. The graph is thus meant to serve as a rough comparison of opioid-related death trends between Calhoun County and Michigan, not other states. Calhoun County likely had a higher opioid-related death rate prior to 2014. The sharp increase seen in 2014 is likely explained by a new medical examiner identifying more opioid-related deaths in the context of a local, state and national increase in opioid-related deaths. CCPHD summed Michigan Department of Health and Human Services (MDHHS) exclusive "heroin" and "opioid" death data for a total opioid death count. *The data set includes all manners of death: underlying causes of unintentional drug poisoning (X40-X44), suicide drug poisoning (X60-X64), homicide drug poisoning (X85), or undetermined intent drug poisoning (Y10-Y14). It includes ICD-10 codes for heroin (T40.1), other opioids (T40.2), methadone (T40.3) and other synthetic narcotics (T40.4); it does not include opium (T40.0) and unspecified opioids (T40.6). This differs slightly from several CDC publications which include T40.0 and T40.6. 2010 US Census estimates were used as the denominator for rates.

Source: Michigan Department of Health and Human Services (MDHHS)

The Western Michigan University Homer Stryker, MD School of Medicine (WMed) Office of the Medical Examiner, through death scene investigation and evaluation by board-certified forensic pathologists, has determined both the cause and manner of death of those who die from apparent alcohol, drug or poison intoxication in Calhoun County since 2014. CCPHD counted an opioid-related death as a death with an opioid listed on the MDHHS death certificate as an underlying cause or as a significant condition contributing to the death. This differs slightly from MDHHS and Centers for Disease Control and Prevention (CDC) methodology, which is based on underlying cause of death only. Accidental and indeterminate deaths describe what is commonly referred to as an “overdose.” Figure 8 shows total opioid-related deaths have remained above 40 per year between 2015-2017, with a decrease in accidental deaths in 2016 followed by an increase in 2017.



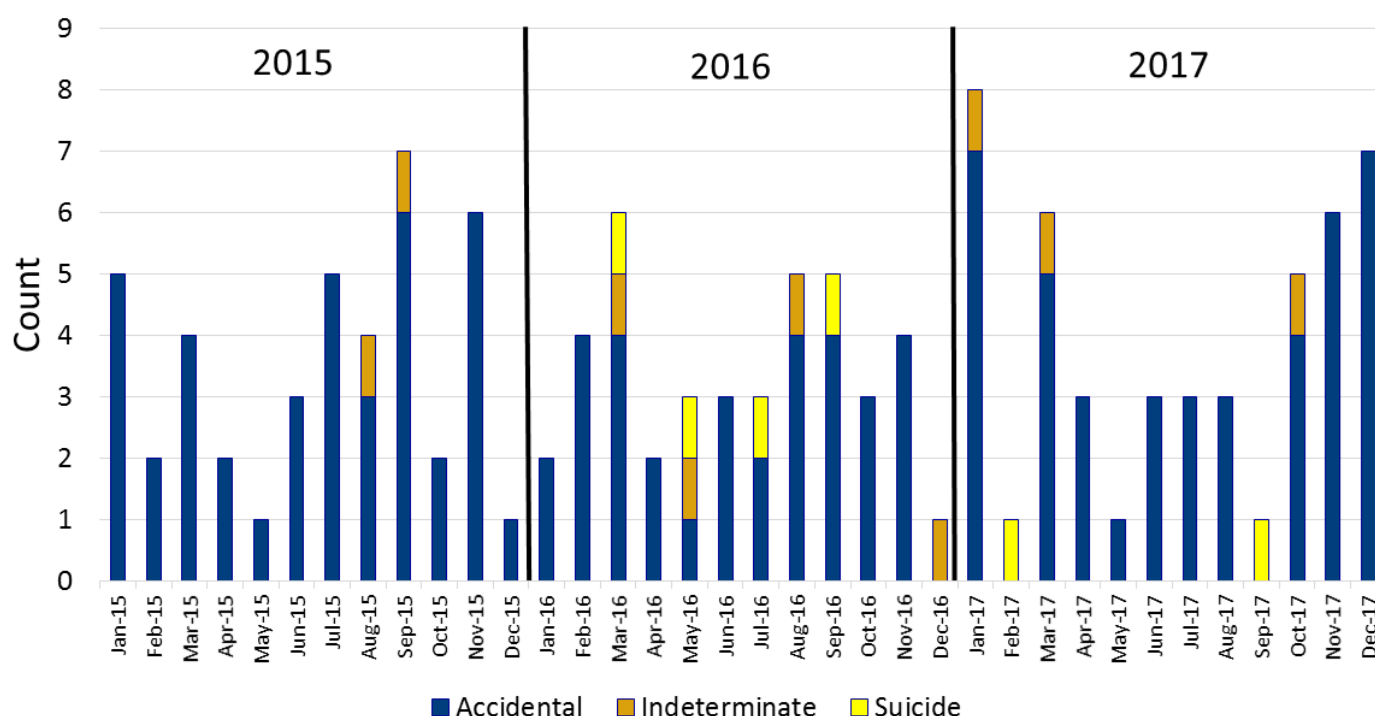
Data Limitations/Definitions: Board-certified forensic pathologists, in accordance with recommendations by the National Association of Medical Examiners, determined the cause and manner of these deaths. MDHHS death certificates include a list of the immediate cause of death and underlying cause of death (Part I), and other significant conditions contributing to death (Part II). Immediate cause of death includes the final disease or condition that resulted in death. Underlying cause of death includes the disease or injury that initiated the events leading to death. An immediate cause can be the same as the underlying cause if only one cause is listed. Other significant conditions includes conditions that contribute to death but do not result in the underlying cause of death. Manners of death include accidental, indeterminate, suicide and homicide. Counts are by date of death rather than pronounced date of death. Medical examiner data are determined by location of death (within Calhoun County), not county of residence of the decedent. Vital statistics on page 8 will therefore differ from these figures.

Source: Dr. Joyce deJong, Calhoun County Medical Examiner

Medical Examiner Opioid-Related Deaths

The WMed Office of the Medical Examiner, through death scene investigation and evaluation by board-certified forensic pathologists, has determined both the cause and manner of death of those who die from apparent alcohol, drug or poison intoxication in Calhoun County since 2014. CCPHD counted an opioid-related death as a death with an opioid listed on the MDHHS death certificate as an underlying cause or as a significant condition contributing to the death. This differs slightly from MDHHS and CDC methodology which is currently based on underlying cause of death only. Accidental and indeterminate deaths describe what is commonly referred to as an “overdose.” Figure 9 shows opioid-related deaths vary by month. Peak months with at least seven accidental or indeterminate deaths include September 2015, January 2017 and December 2017. In January 2017, an outbreak of 8 fentanyl-related deaths occurred over a period of 23 days. Fentanyl contributed to all opioid-related deaths that month. Five of these deaths involved fentanyl analogs. See pages 11-12 for details.

Figure 9 Calhoun County Medical Examiner Opioid-Related Deaths by Month and Manner of Death



Data Limitations/Definitions: Board-certified forensic pathologists, in accordance with recommendations by the National Association of Medical Examiners, determined the cause and manner of these deaths. MDHHS death certificates include listing of the immediate cause of death and underlying cause of death (Part I), and other significant conditions contributing to death (Part II). Immediate cause of death includes the final disease or condition that resulted in death. Underlying cause of death includes the disease or injury that initiated the events leading to death. The immediate cause can be the same as the underlying cause if only one cause is listed. Other significant conditions includes conditions that contribute to death but do not result in the underlying cause of death. Manners of death include accidental, indeterminate, suicide and homicide. Counts are by date of death rather than pronounced date of death. Medical examiner data are determined by location of death (within Calhoun County), not county of residence of the decedent. Vital statistics on page 8 will therefore differ from these figures.

Source: Dr. Joyce deJong, Calhoun County Medical Examiner

Fentanyl is a very powerful **synthetic opioid** that is 50 to 100 times more potent than morphine. Fentanyl can be prescribed by a licensed healthcare professional or produced illicitly. As a scheduled II drug, it is prescribed to treat severe pain and in relation to surgery. Prescription forms of fentanyl include injections, skin patches or lozenges under the brand names Sublimaze®, Duragesic® and Actiq®. In contrast, **illicitly manufactured fentanyl (IMF)** is produced in clandestine laboratories and has emerged across the United States, predominately in the Midwest and Northeast, as an increasing driver of the overdose epidemic. According to the National Institute on Drug Abuse (NIDA) IMF can be distributed as powder, spiked on blotter paper, mixed with heroin or formulated as tablets that mimic the appearance of other opioids. Thus, IMF can be swallowed, snorted, injected or absorbed on the mouth's mucous membranes. IMF also includes many novel chemical variations of fentanyl called **fentanyl analogs** such as carfentanil, furanylfentanyl, and acetylfentanyl. NIDA states, "street names for fentanyl or for fentanyl-laced heroin include Apache, China Girl, China White, Dance Fever, Friend, Goodfella, Jackpot, Murder 8, TNT, and Tango and Cash."

IMF presents several challenges to public health and public health surveillance. First, a person may not be aware of the presence of IMF mixed with heroin or in illicitly purchased tablets. This fact along with the high potency of IMF makes it easier to overdose. Second, the detection of fentanyl analogs requires costly, specialized testing available only at a limited number of laboratories.

Figure 10 shows age-adjusted death rates by opioid category from 1999-2016 for the United States. Prescription opioids (natural and semisynthetic opioids) contributed to the highest rate from 1999 to about 2014. From 2015 to 2016, the rate for overdose attributed to synthetic opioids (mostly fentanyl and fentanyl analogs) doubled from 3.1 to 6.2 per 100,000 people and surpassed both prescription and heroin-related death rates.

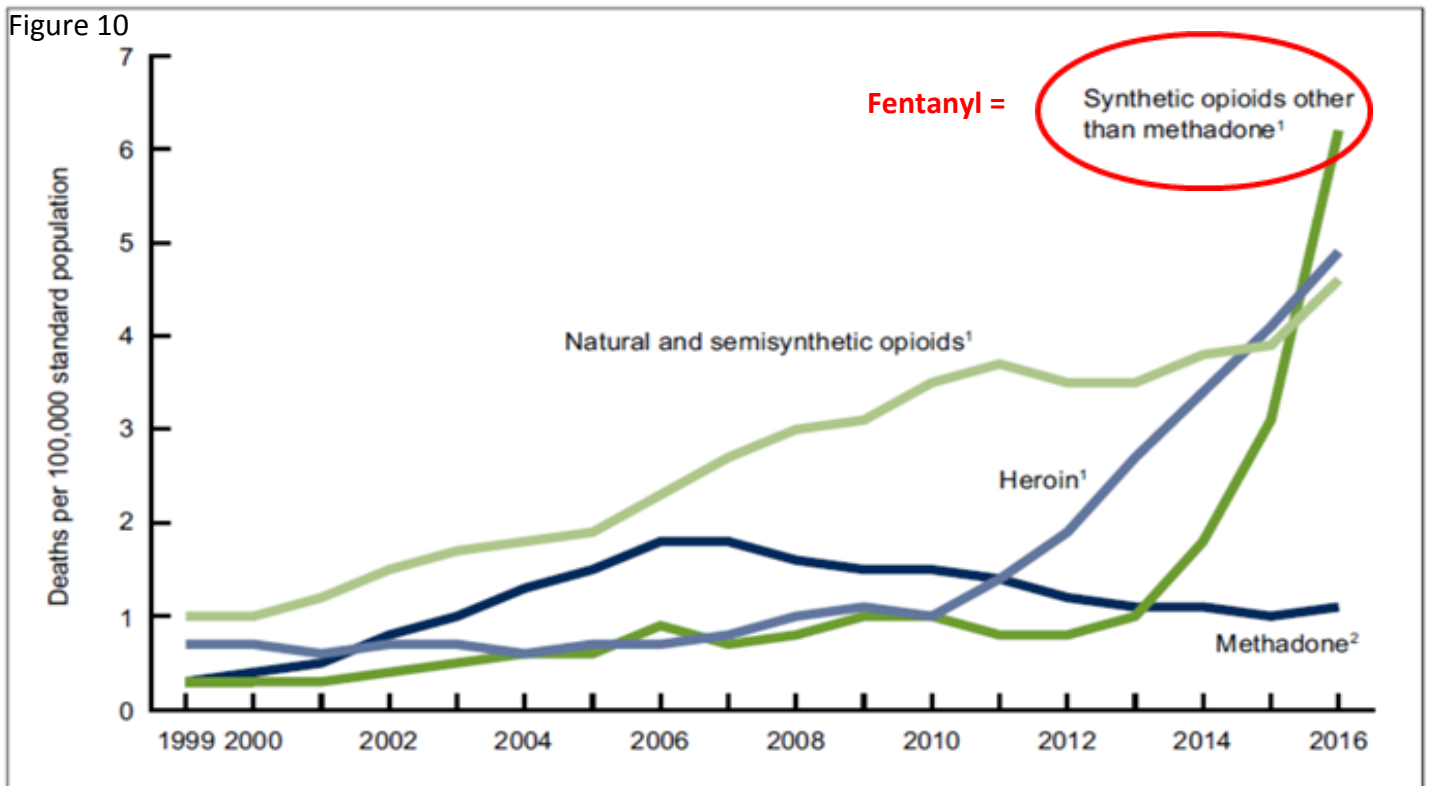


Image Source: Hedegaard H, Warner M, Minino AM. Drug overdose deaths in the United States 1999-2016. NCHS Data Brief, no 294. Hyattsville, MD: National Center for Health Statistics, 2017.

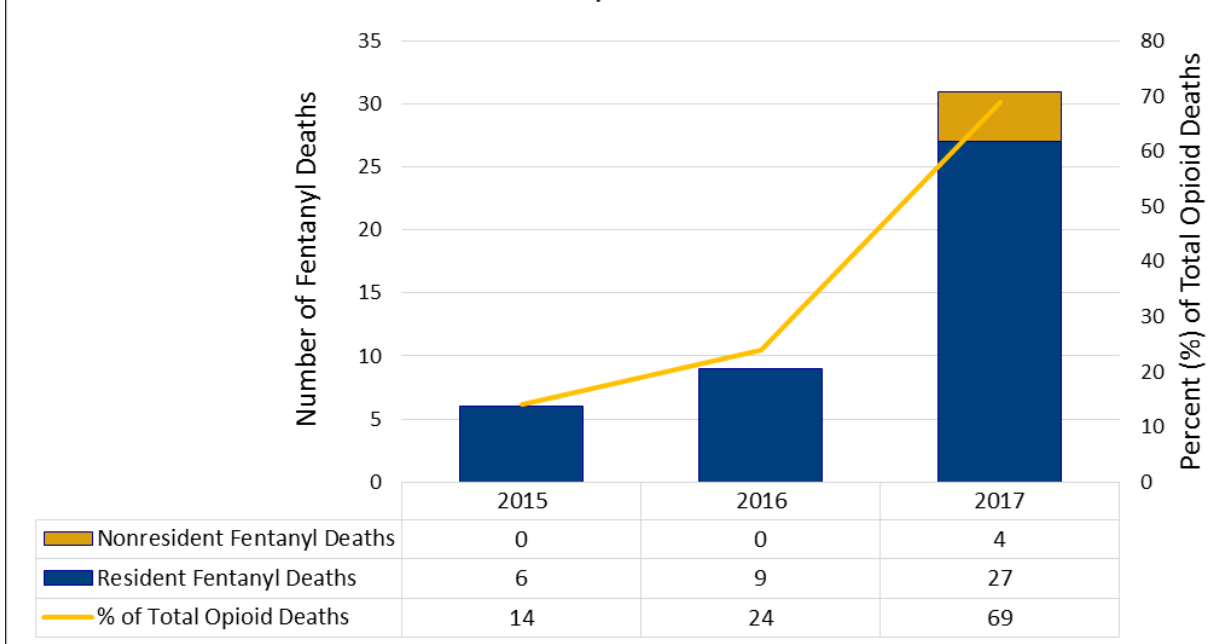
Figure 11 illustrates fentanyl-related deaths by year, county of residence and percentages of total opioid-related deaths. The blue bar represents the number of Calhoun County resident fentanyl-related deaths. The gold bar represents the number of non-Calhoun County resident fentanyl-related deaths. The orange line represents the percentages of total opioid-related deaths that included fentanyl.

Illicitly manufactured fentanyl (IMF) is now driving the opioid overdose epidemic in Calhoun County and poses a serious public health threat. Fentanyl-related deaths increased from 6 in 2015 to 31 in 2017. In 2017, 69% of accidental and indeterminate opioid-related deaths involved fentanyl. This trend most likely reflects a true increase in the incidence of fentanyl-related deaths and the prevalence of IMF in Calhoun County as opposed to increased detection of fentanyl or fentanyl analogs. While fentanyl testing has been routine, fentanyl analog testing by the Calhoun County Medical Examiner began to increase in October 2016. However, of the seven fentanyl analog-related deaths in 2017, four included non-analog fentanyl as well.

Fentanyl-Related Death Outbreak

In January 2017, an outbreak of 8 fentanyl-related deaths occurred over a period of 23 days. Fentanyl contributed to all opioid-related deaths that month. Four deaths involved a drug called carfentanyl, a fentanyl analog 10,000 times more potent than morphine. One additional death involved a fentanyl analog called furanylfentanyl. All fentanyl analog deaths were residents of Calhoun County. One fentanyl death was a nonresident but died at a Calhoun County residence. The outbreak accounted for five of the seven fentanyl analog-related deaths in 2017.

Figure 11 Calhoun County Medical Examiner Fentanyl-Related Deaths by Year and County of Residence

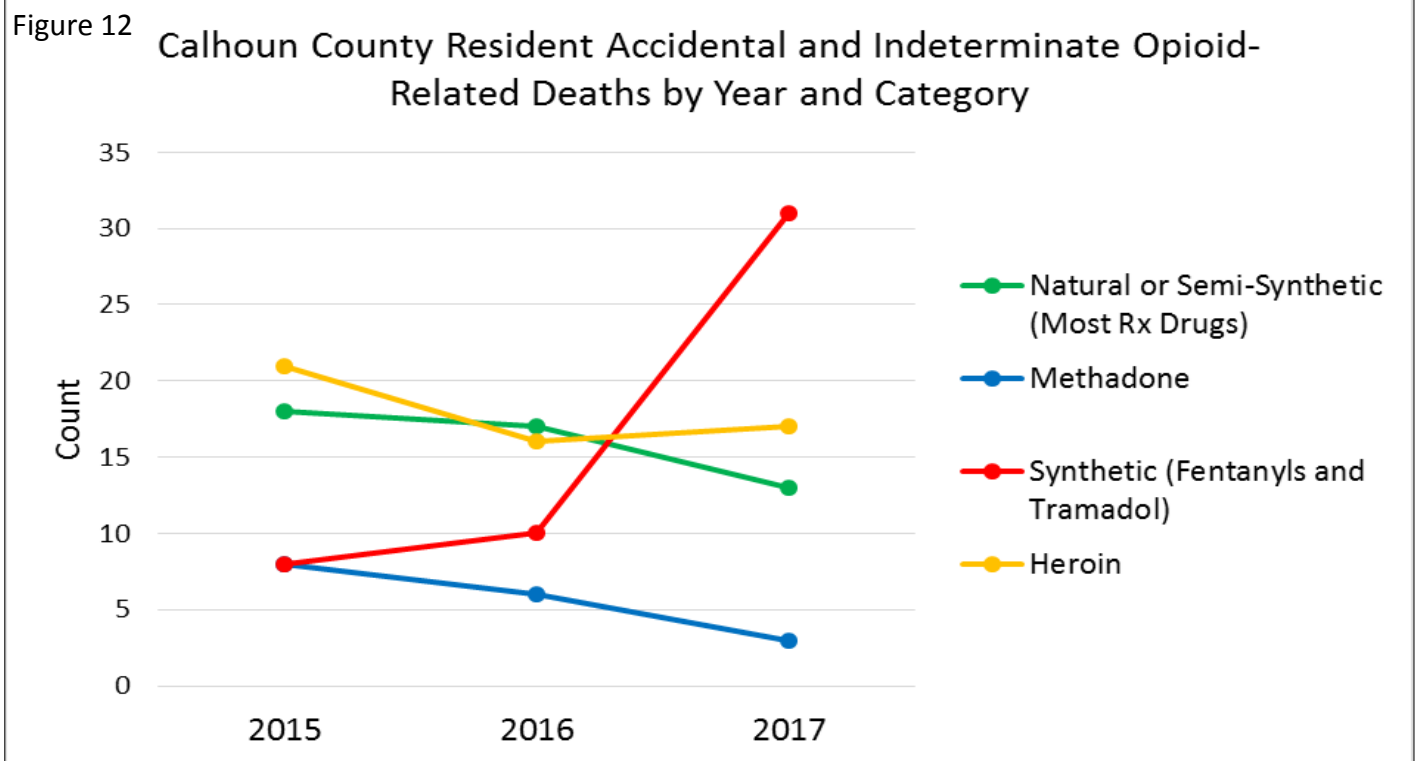


Data Limitations/Definitions: None of the nonresident fentanyl-related deaths occurred at a hospital, which suggests these nonresidents overdosed on fentanyl within Calhoun County and were not transported from out-of-county for medical attention. CCPHD counted a fentanyl-related death as a death with fentanyl listed on the MDHHS death certificate as an underlying cause or as a significant condition contributing to the death. These data include accidental and indeterminate deaths identified by the methods described on page 9-10.

Source: Dr. Joyce deJong, Calhoun County Medical Examiner

The CDC categorizes opioids into four groups: natural or semi-synthetic opioids, synthetic opioids, methadone and heroin. Natural or semi-synthetic opioids include most prescription opioids such as morphine, codeine, oxycodone (e.g. Oxycontin®), hydrocodone (e.g. Vicodin®), hydromorphone (e.g. Dilaudid®), oxymorphone (e.g. Opana®) and buprenorphine (e.g. Suboxone®, Subutex®). Synthetic opioids include fentanyl, fentanyl analogs, and tramadol (e.g. Ultram®). Methadone is a separate synthetic opioid that can be prescribed for both pain and opioid dependence. Heroin is an illicit opioid that can be injected, snorted or smoked.

From 2016 to 2017, deaths related to synthetic opioids, predominately comprised of fentanyl, sharply increased in Calhoun County. In 2017, synthetic opioids contributed to the most deaths of any opioid category. Natural and semi-synthetic opioid-related deaths remain elevated but have trended downward slightly from 2015 to 2017. Heroin-related deaths remain elevated. Methadone-related deaths trended downward from 2015 to 2017. See pages 14-17 for additional trend and demographic details.



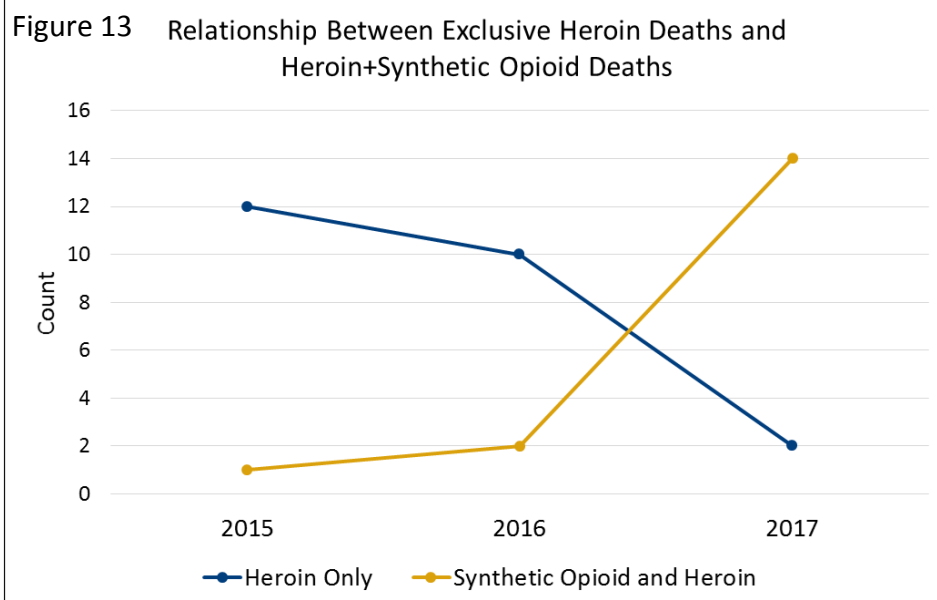
Data Limitations/Definitions: Most drug-related deaths involve more than one drug or opioid. Therefore, the listed opioid categories in Figure 12 are not mutually exclusive and do not sum to total opioids in Table 5 on page 16. These data include accidental and indeterminate deaths identified by the methods described on page 9-10. If more than one opioid from the same category was present in the same decedent, only one count for the category was included. See Table 6 on page 16 for an analysis of tramadol categorized with natural or semi-synthetic opioids as a prescription drug group rather than with fentanyl in the synthetic opioid category. Figure 12 does not include Calhoun County residents who may have died outside of Calhoun County or nonresidents who may have died within Calhoun County.

Source: Dr. Joyce Dejong, Calhoun County Medical Examiner

Table 2: Exclusive Opioid Category Combinations Among Accidental and Indeterminate Opioid-Related Deaths for Calhoun County Residents, 2015-2017

	2015 Count	2016 Count	2017 Count
Heroin	12	10	2
Methadone	5	3	0
Methadone, Heroin	2	0	1
Methadone, Synthetic Opioid	0	0	1
Methadone, Synthetic Opioid, Heroin	0	2	0
Natural or Semi-synthetic Opioid, Heroin	5	0	0
Natural or Semi-synthetic Opioid, Methadone	1	1	1
Natural or Semi-synthetic Opioid, Synthetic Opioid	3	3	8
Natural or Semi-synthetic Opioid, Synthetic Opioid, Heroin	1	2	0
Natural or Semi-synthetic Opioid	8	11	4
Synthetic Opioid	3	1	8
Synthetic Opioid, Heroin	1	2	14
Total	41	35	39

Table 2 lists all the opioid category combinations found in Calhoun County residents who died of an accidental or indeterminate opioid-related death between 2015-2017 within Calhoun County. Unlike Table 5 and Figure 12 opioid category analysis, Table 2 data is mutually exclusive and sums to total accidental and indeterminate opioid-related deaths by year. If more than one opioid from the same category was present in the same decedent, only one count for the category was included. Table 2 does not include residents who may have died outside of Calhoun County or nonresidents who died within Calhoun County. Figure 13 shows that opioid-related deaths due to heroin only have decreased while heroin + synthetic opioid-related deaths have increased from 2015 to 2017. This trend likely reflects an increase in the use of heroin laced with illicitly manufactured fentanyl (IMF) and/or increased concomitant use of heroin and IMF.



Source: Dr. Joyce deJong, Calhoun County Medical Examiner

The drug and opioid demographic tables on pages 15-19 include those who died from apparent alcohol, drug or poison intoxication within Calhoun County. Drug-related deaths were counted by CCPHD by the same method as opioid-related deaths outlined on pages 9-10. An opioid-related death is a subset of drug-related deaths. This report does not include deaths due to long term, i.e. chronic, substance use such as alcoholic liver disease or infection or due to an injury involving a substance such as a motor vehicle accident. The drug-related death tables on pages 18-19 are by Calhoun County residency and all manners of death (accidental, indeterminate, suicide and homicide). Given the interest in deaths due to opioid “overdose,” the opioid-related death table demographics on pages 16-17 are by Calhoun County residency and accidental and indeterminate manners of death only.

Most drug and opioid-related deaths involve more than one substance (polysubstance). In 2017, 95% of Calhoun County resident drug-related deaths involved an opioid. The 3-year average sex-specific rate for opioid-related overdose was 1.7 times higher in males compared to females. The number of whites (n=97) who died from an opioid overdose from 2015 to 2017 was nearly 6.5 times higher than blacks (n=15). Although the race-specific rate for blacks appears to be higher than whites, the 95% confidence interval is wide and overlaps with the rate for whites. The age groups between 25-54 years comprised most of the accidental and indeterminate opioid-related deaths with the highest rate in the 35-44 year age group. The median and mean ages were 38 and 40 years respectively.

Years of Potential Life Lost (YPLL) is a measure that attempts to capture the burden of premature death that occurs prior to an average lifespan of 75 years. The number of YPLL is calculated by taking the difference between the age of a person at death and 75 years among those who die before their 75th year. In 2017, 1418 years of potential life were lost among Calhoun County residents who died of an accidental or indeterminate opioid-related death (Table 3).

Table 3

Years of Potential Life Lost (YPLL) Due To Opioid-Related Deaths among Calhoun Residents by Manner of Death			
Year	Accidental+ Indeterminate	Suicide	Total
2015	1464	37	1501
2016	1311	53	1364
2017	1418	53	1471

Table 3 does not include nonresidents or Calhoun residents who may have died outside of Calhoun County.

Drug-Related Deaths as Injuries

Drug-related deaths can be characterized as an injury-related death. Regardless of county of residence, where a person uses a substance in relation to where a person dies matters, because behaviors can be targeted for prevention and treatment interventions in the environment they occur. Location of death, such as a home or hospital, may also indicate severity of injury, medical transport, and opportunity for intervention. Nearly all drug and opioid-related deaths that occur in Calhoun County occur among Calhoun County residents. According to the Office of the Medical Examiner, in 2017 all 8 nonresident drug-related deaths involved incidents that occurred within Calhoun County; 7 of these deaths occurred outside a hospital. Table 4 shows the increase in counts and rates of 2017 accidental and indeterminate opioid-related deaths if nonresident data were included.

Table 4

Sensitivity Analysis: 2017 Opioid-Related Deaths with 6 Non-Calhoun County Residents Included		
Substance/Opioid Category	Count +	Rate +
Any alcohol	2	1.48
Any benzodiazepine	0	0.00
Any cocaine	1	0.74
Any methamphetamine	1	0.74
Any fentanyl	4	2.97
Any tramadol	0	0.00
Polysubstance	4	2.97
Natural or Semi-Synthetic	2	1.48
Methadone	0	0.00
Synthetic	4	2.97
Heroin	3	2.23

OPIOID-RELATED DEATHS

Table 5

	2015			2016			2017		
	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
Residency									
Calhoun Resident	41	98%	30.4	39	95%	29.0	41	87%	30.4
Non-Calhoun Resident	1	2%	-	2	5%	-	6	13%	-
Total	42	100%	-	41	100%	-	47	100%	-

% of Resident Opioid-Related Deaths

Manner of Death									
Accidental	39	95%	-	31	80%	-	37	90%	-
Indeterminate	2	5%	-	4	10%	-	2	5%	-
Suicide	0	0%	-	4	10%	-	2	5%	-
Homicide	0	0%	-	0	0%	-	0	0%	-

% of Resident Accidental and Indeterminate Opioid-Related Deaths

Substance									
Any alcohol	9	22%	6.7	2	6%	1.5	11	28%	8.2
Any benzodiazepine	27	66%	20.0	14	40%	10.4	15	39%	11.1
Any cocaine	9	22%	6.7	9	26%	6.7	11	28%	8.2
Any methamphetamine	2	5%	1.5	2	6%	1.5	5	13%	3.7
Any fentanyl	6	15%	4.5	9	26%	6.7	27	69%	20.0
Any tramadol	2	5%	1.5	1	3%	0.7	4	10%	3.0
Polysubstance	36	88%	26.7	30	86%	22.3	38	97%	28.2
Opioid Category									
Natural or Semi-Synthetic	18	45%	13.4	17	49%	12.6	13	33%	9.7
Methadone	8	19%	5.9	6	17%	4.5	3	8%	2.2
Synthetic	8	19%	5.9	10	29%	7.4	31	79%	23.0
Heroin	21	52%	15.6	16	46%	11.9	17	44%	12.6

Crude rates are per 100,000 people and use 2012-2016 American Census Survey 5-year estimates for Calhoun County as denominators. Smaller counts have more unreliable rates. Substances and opioid categories are not mutually exclusive and do not sum to total figures. The manner of death, substance and opioid category data in Table 5 do not include Calhoun residents who may have died outside of Calhoun County or nonresidents who died within Calhoun County.

One disadvantage of the four CDC opioid categories (pages 13-14) is the categorization of tramadol, a synthetic prescription opioid, along with fentanyl. Table 6 shows counts if tramadol is removed from the synthetic category and placed with natural or semisynthetic opioids to form a prescription (Rx Drugs) group. Of note, no fentanyl-related deaths from 2015-2017 also included tramadol. However, several natural or semisynthetic-related deaths included tramadol.

Table 6			
	2015	2016	2017
Rx Drugs	19	18	14
Methadone	8	6	3
Fentanyl	6	9	27
Heroin	21	16	17

Source: Dr. Joyce deJong, Calhoun County Medical Examiner

Table 7: 2015-2017 Combined Resident Accidental and Indeterminate Opioid-Related Deaths

	N	3-Year Avg Rate	95% CI
Sex			
Male	71	36.0	34.3-37.6
Female	44	21.3	20.2-22.4
Race			
White	97	29.1	28.9-29.4
Black	15	34.3	26.7-41.9
Other	3	--	--
Age			
15-24	7	13.1	7.1-19.0
25-34	27	55.9	53.5-58.4
35-44	36	74.9	69.5-80.3
45-54	27	49.0	46.9-51.2
55-64	13	23.4	18.4-28.3
65+	5	7.6	1.1-14.1

Sex, race and age-specific rates were calculated as a 3-year average given the small numbers in some groups. Rates are per 100,000 people and use 2012-2016 American Census Survey 5-year estimates for Calhoun County as denominators. This table does not include Calhoun County residents who may have died outside of Calhoun County or nonresidents who died within Calhoun County.

DRUG-RELATED DEATHS

Table 8

	2015			2016			2017		
	Number	Percent	Rate	Number	Percent	Rate	Number	Percent	Rate
Residency									
Calhoun Resident	46	96%	34.2	45	96%	33.4	43	84%	31.9
Non-Calhoun Resident	2	4%	-	2	4%	-	8	16%	-
Total	48	100%	-	47	100%	-	51	100%	-

% of Resident Drug-Related Deaths

Manner of Death									
Accidental	43	94%	-	35	78%	-	38	88%	-
Indeterminate	2	4%	-	5	11%	-	3	7%	-
Suicide	1	2%	-	5	11%	-	2	5%	-
Homicide	0	0%	-	0	0%	-	0	0%	-
Substance									
Any alcohol	10	22%	7.4	5	11%	3.7	11	26%	8.2
Any benzodiazepine	28	61%	20.8	16	36%	11.9	16	37%	11.9
Any cocaine	11	24%	8.2	12	27%	8.9	14	28%	10.4
Any methamphetamine	2	4%	1.5	2	4%	1.5	5	12%	3.7
Any opioid	41	89%	30.4	39	87%	29.0	41	95%	30.4
Any fentanyl	6	13%	4.5	10	22%	7.4	28	65%	20.8
Any tramadol	2	4%	1.5	1	2%	0.7	4	9%	3.0
Polysubstance	37	80%	27.5	35	78%	26.0	40	93%	29.7
Opioid Category									
Natural or Semi-Synthetic	18	39%	13.4	20	44%	14.8	14	33%	10.4
Methadone	8	17%	5.9	5	11%	3.7	3	7%	2.2
Synthetic	8	17%	5.9	11	24%	8.2	32	74%	23.8
Heroin	21	46%	15.6	16	36%	11.9	17	40%	12.6

Crude rates are per 100,000 people and use 2012-2016 American Census Survey 5-year estimates for Calhoun County as denominators. Smaller counts have more unreliable rates. Substances and opioid categories are not mutually exclusive and due to sum to total figures. The manner of death, substance and opioid category data in Table 8 do not include Calhoun County residents who may have died outside of Calhoun County or Calhoun County or nonresidents who died within Calhoun County. Both Table 5 and Table 8 use date of death and not the pronounced date of death from the MDHHS death certificate. Please note Table 8 substance and opioid category analysis is by all manners of death unlike Table 5.

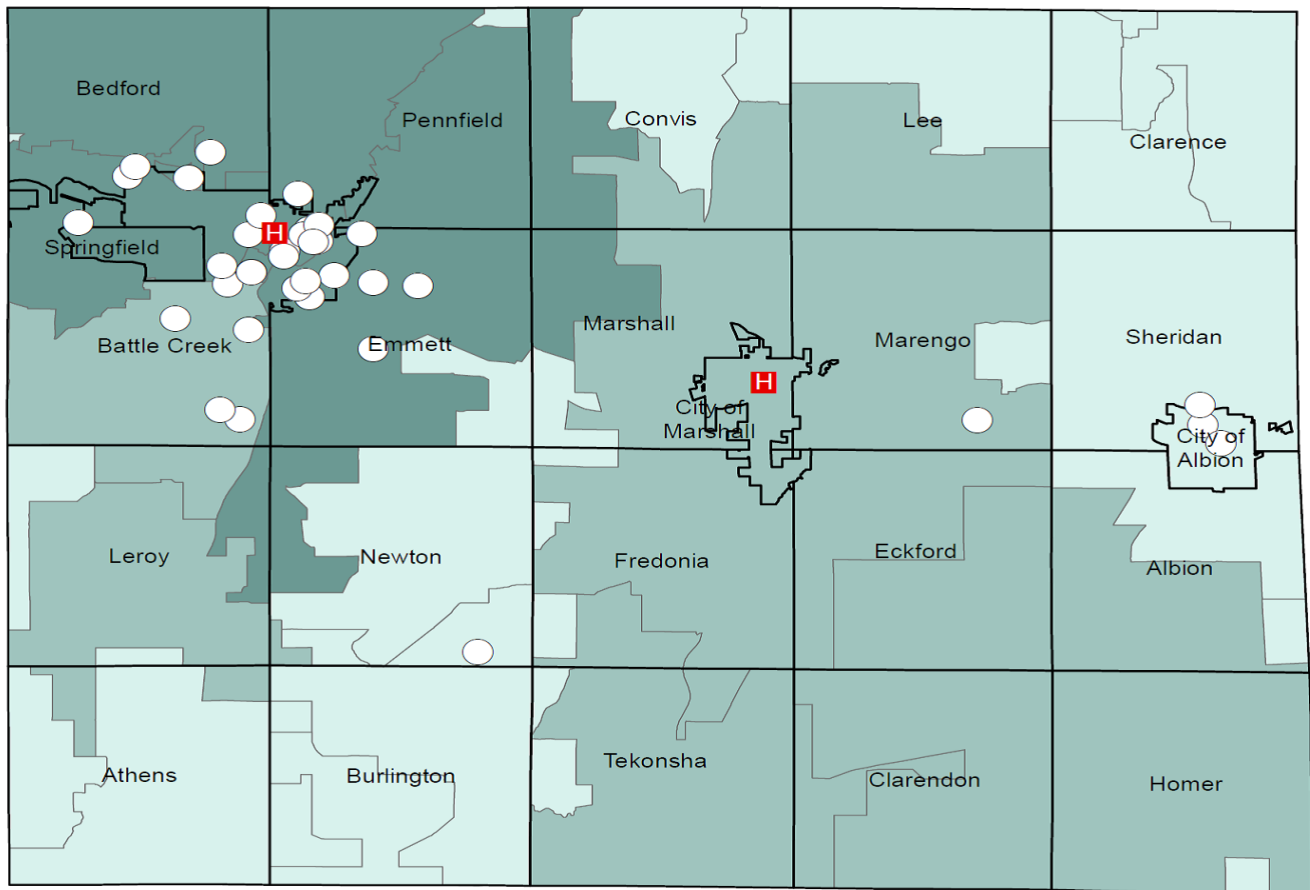
Table 9: 2015-2017 Combined Resident Drug-Related Deaths

	N	3-Year Avg Rate	95% CI
Sex			
Male	82	41.5	40.5-42.6
Female	52	25.2	24.3-26.0
Race			
White	114	34.2	33.9-34.6
Black	17	38.9	31.6-46.3
Other	3	--	--
Age			
15-24	7	13.1	7.1-19.0
25-34	29	60.1	57.3-62.8
35-44	44	91.6	85.7-97.5
45-54	31	56.3	55.2-57.4
55-64	15	27.0	19.1-34.9
65+	8	12.1	6.3-17.9

Sex, race and age-specific rates were calculated as a 3-year average given the small numbers in some groups. Rates are per 100,000 people and use 2012-2016 American Census Survey 5-year estimates for Calhoun County as denominators. Table 9 includes all manners of death. Table 9 does not include Calhoun County residents who may have died outside of Calhoun County or nonresidents who died within Calhoun County.

The top three zip codes with the highest rates of unintentional and undetermined opioid overdose visits to an emergency department in Calhoun County were 49037, 49017, and 49015. Total opioid-related deaths include heroin and fentanyl-related deaths. Total opioid overdose emergency department visits include visits coded as heroin overdoses.

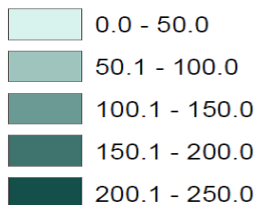
Figure 14



Calhoun County, 2015

○ Opioid Related Death H Area Hospitals

Unintentional and Undetermined Opioid Overdose Emergency Department Visits (Rate per 100,000 population)



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

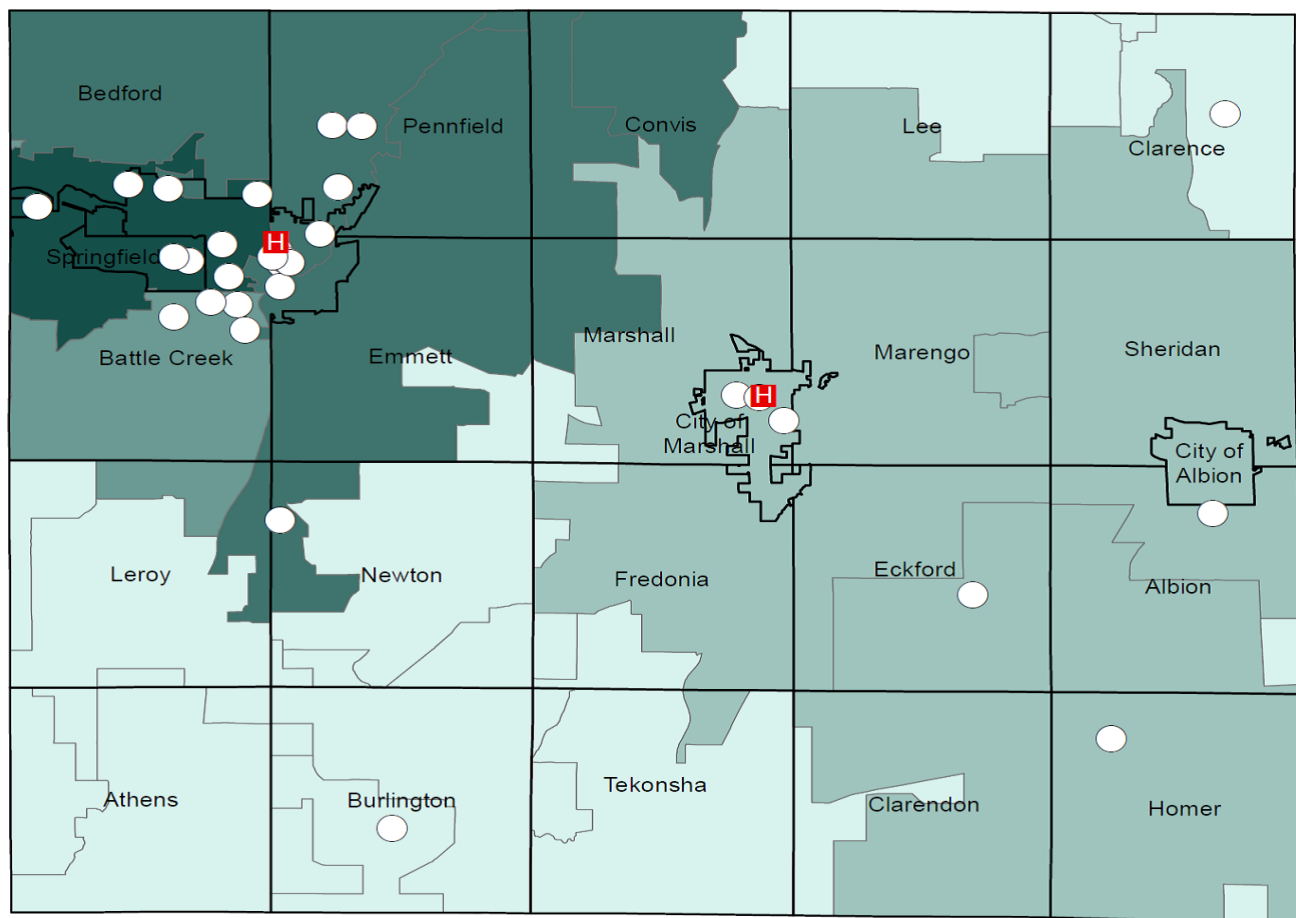
Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*6 deaths occurred at Area Hospitals

The top three zip codes with the highest rates of unintentional and undetermined opioid overdose visits to an emergency department in Calhoun County were 49037, 49017, and 49014. Total opioid-related deaths include heroin and fentanyl-related deaths. Total opioid overdose emergency department visits include visits coded as heroin overdoses.

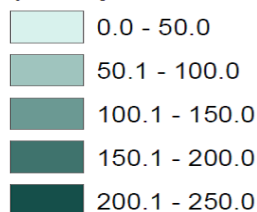
Figure 15



Calhoun County, 2016

○ Opioid Related Death **H** Area Hospitals

Unintentional and Undetermined Opioid Overdose Emergency Department Visits (Rate per 100,000 population)



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

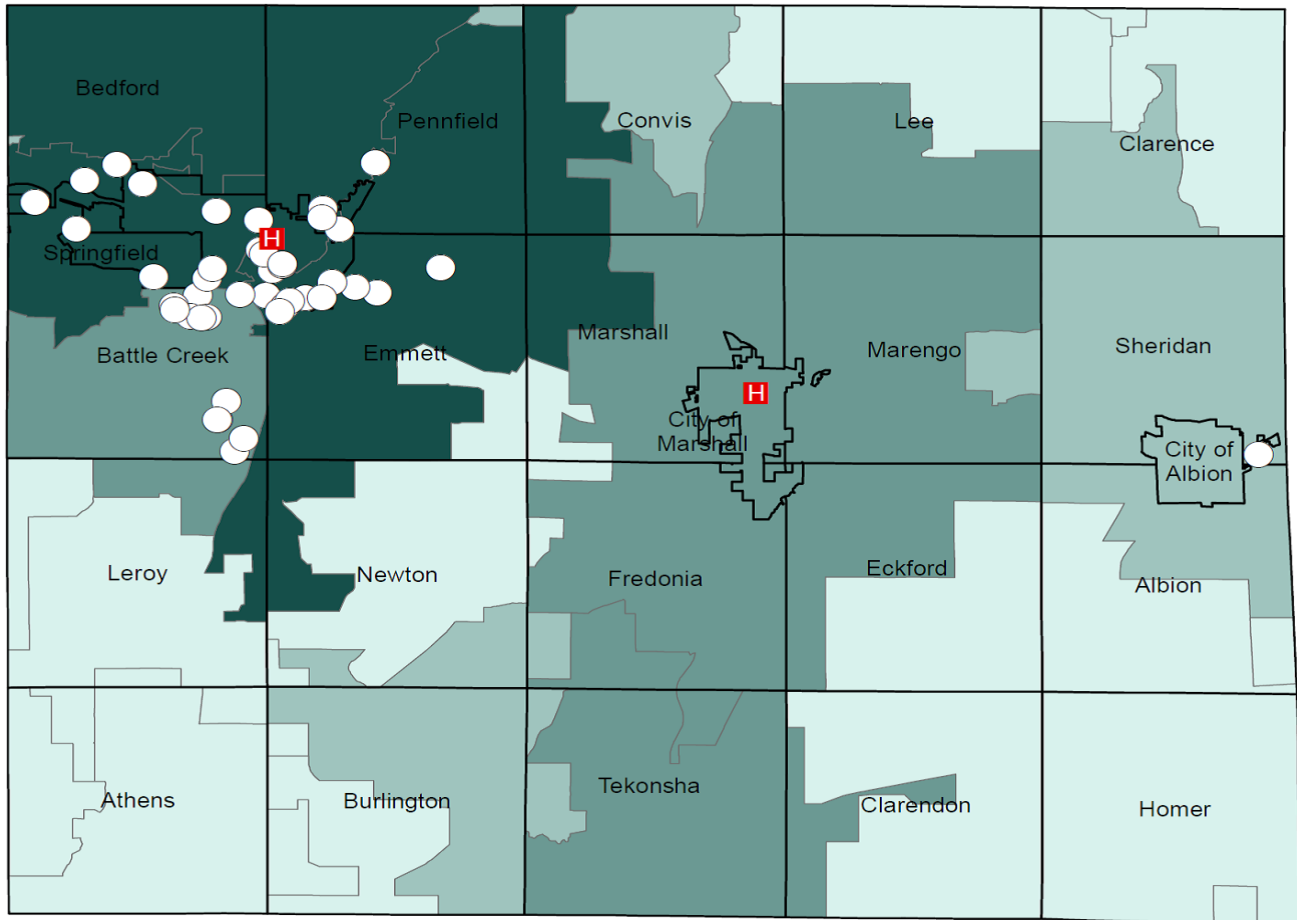
Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*5 deaths occurred at Area Hospitals

The top three zip codes with the highest rates of unintentional and undetermined opioid overdose visits to an emergency department in Calhoun County were 49037, 49017, and 49014. Total opioid-related deaths include heroin and fentanyl-related deaths. Total opioid overdose emergency department visits include visits coded as heroin overdoses.

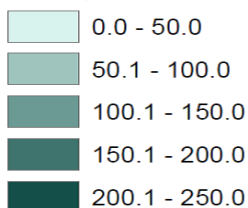
Figure 16



Calhoun County, 2017

○ Opioid Related Death **H** Area Hospitals

Unintentional and Undetermined Opioid Overdose Emergency Department Visits Rate per 100,000 population



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

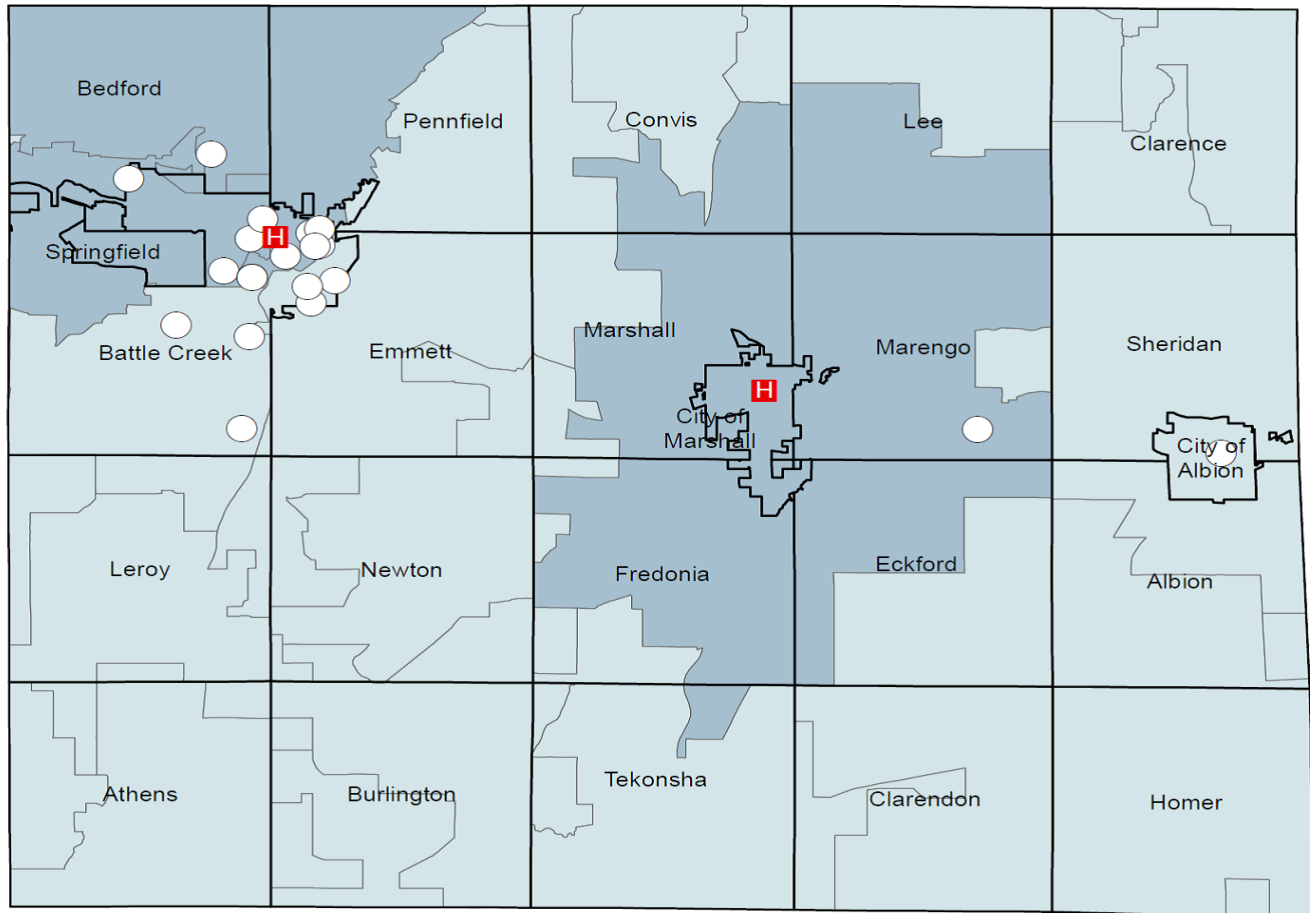
Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*3 deaths occurred at Area Hospitals

The top three zip codes with the highest rates of unintentional and undetermined heroin overdose visits to an emergency department in Calhoun County were 49015, 49017, and 49037. Heroin-related deaths are a proportion of total opioid-related deaths mapped in Figures 14-16 by year.

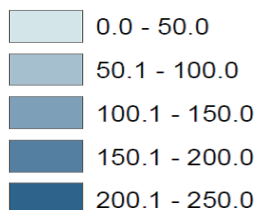
Figure 17



Calhoun County, 2015

○ Heroin Related Death **H** Area Hospitals

Unintentional and Undetermined Heroin Overdose Emergency Department Visits (Rate per 100,000 population)



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

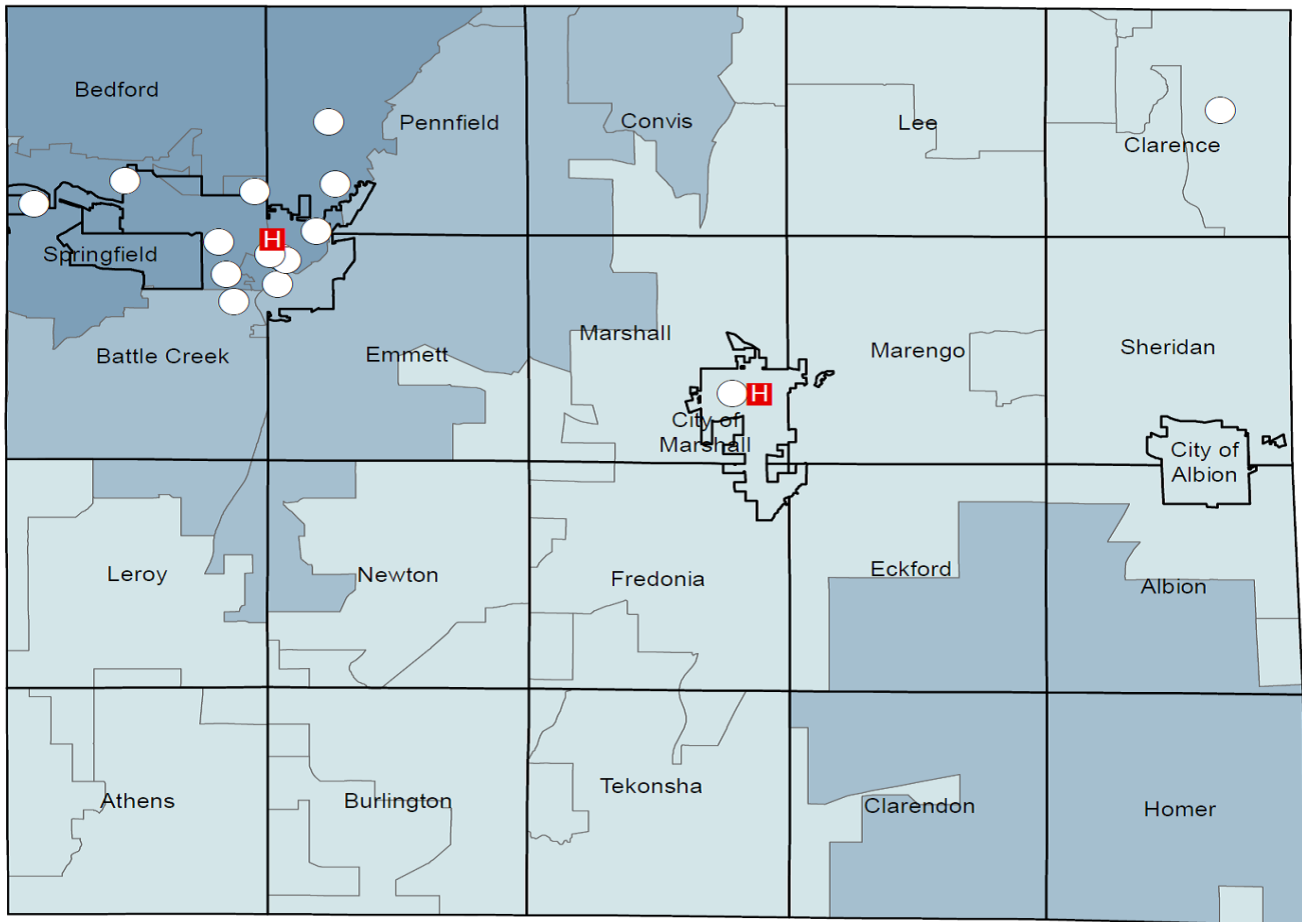
Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*2 deaths occurred at Area Hospitals

The top three zip codes with the highest rates of unintentional and undetermined heroin overdose visits to an emergency department in Calhoun County were 49037, 49017, and 49014. Heroin-related deaths are a proportion of total opioid-related deaths mapped in Figures 14-16 by year.

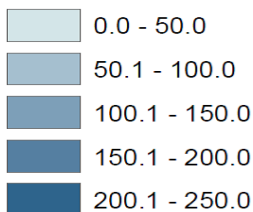
Figure 18



Calhoun County, 2016

○ Heroin Related Death **H** Area Hospitals

Unintentional and Undetermined Heroin Overdose Emergency Department Visits (Rate per 100,000 population)



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

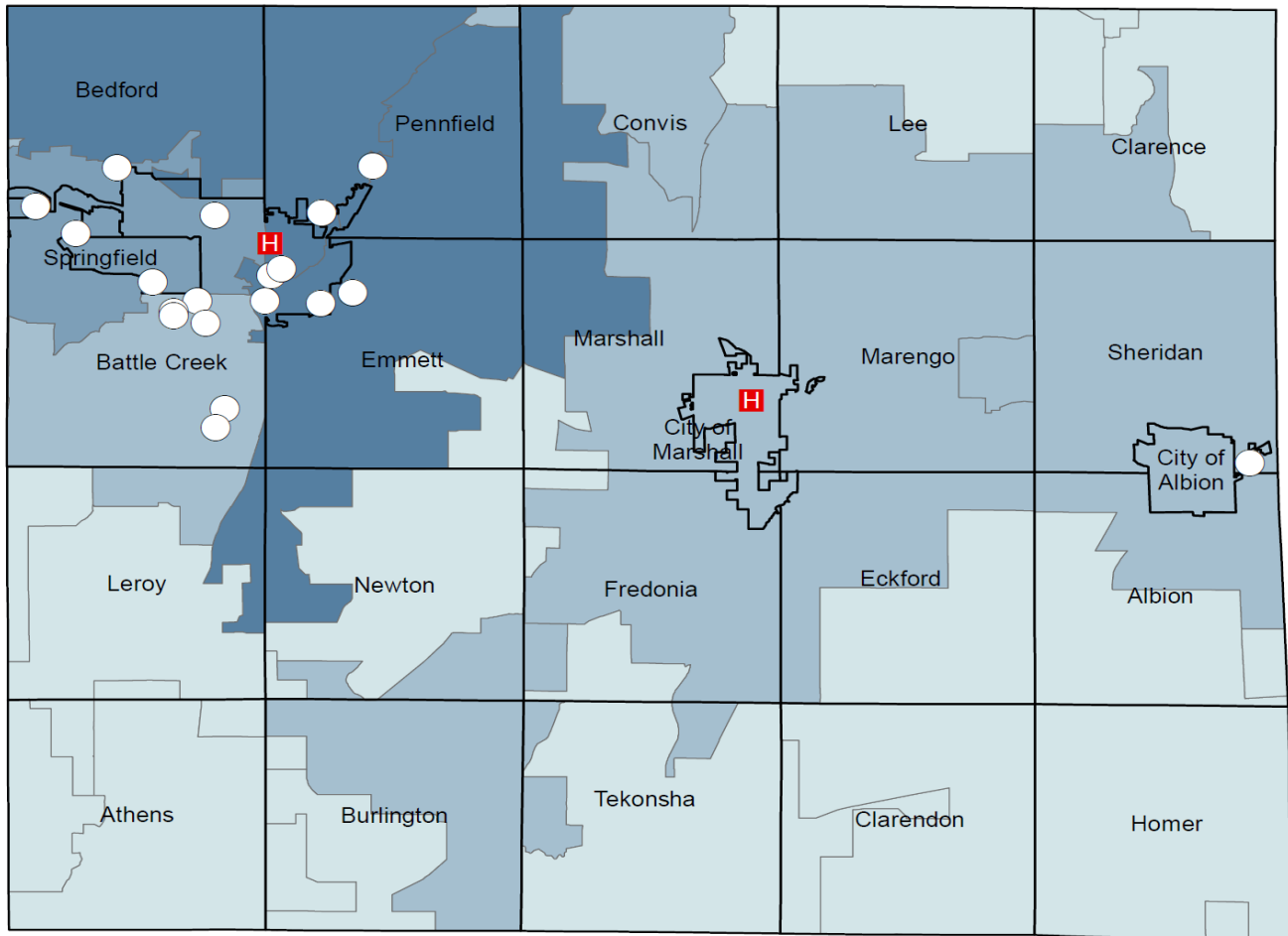
Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*2 deaths occurred at Area Hospitals

The top three zip codes with the highest rates of unintentional and undetermined heroin overdose visits to an emergency department in Calhoun County were 49014, 49017, and 49037. Heroin-related deaths are a proportion of total opioid-related deaths mapped in Figures 14-16 by year.

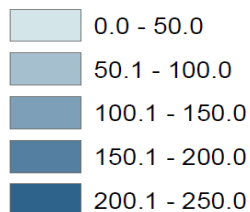
Figure 19



Calhoun County, 2017

○ Heroin Related Death **H** Area Hospitals

Unintentional and Undetermined Heroin Overdose Emergency Department Visits Rate per 100,000 population



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

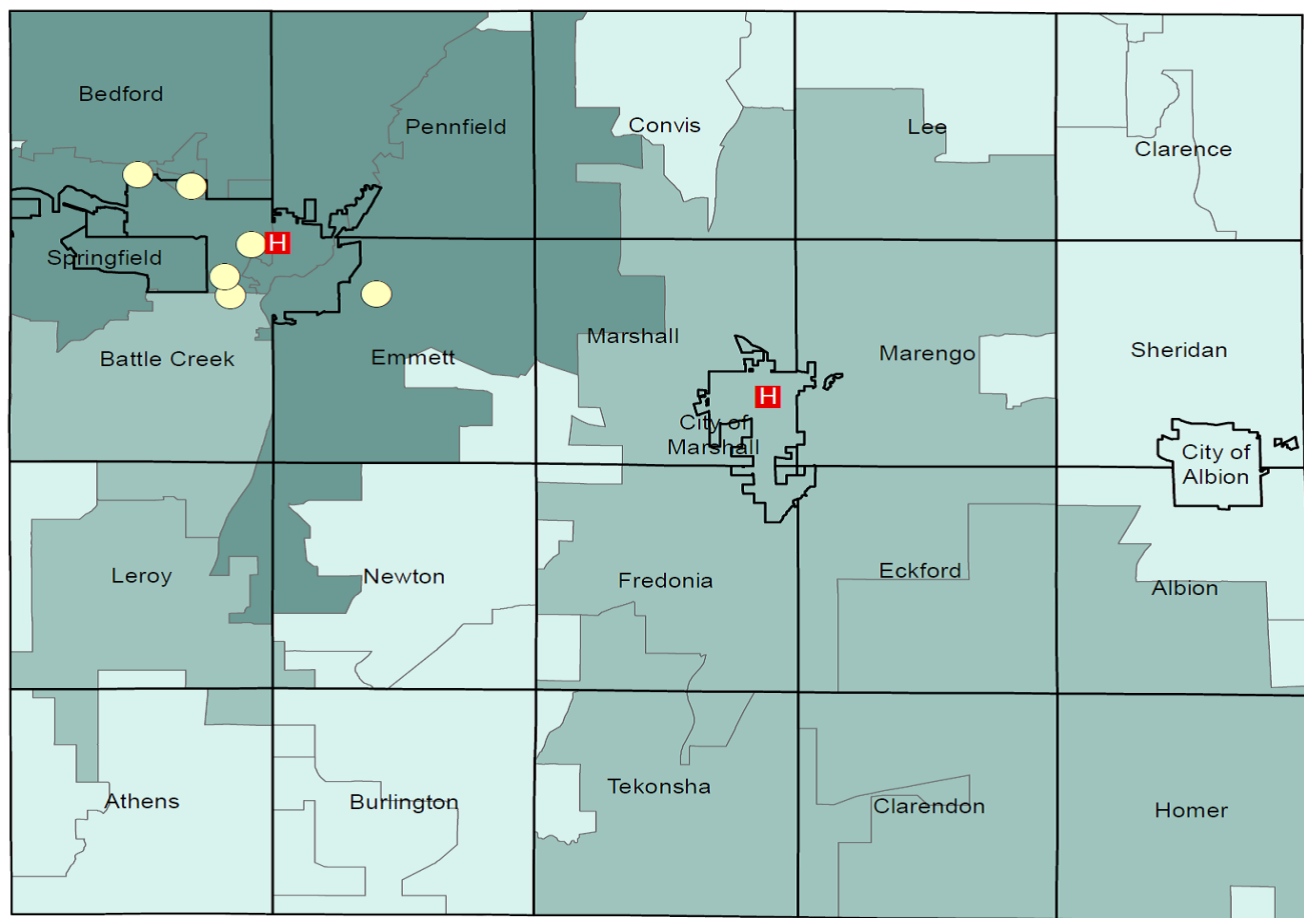
Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*1 death occurred at Area Hospitals

The top three zip codes with the highest rates of unintentional and undetermined opioid overdose visits to an emergency department in Calhoun County were 49037, 49017, and 49015. Figures 20-23 use fentanyl-related death locations but total opioid overdose emergency department rates as backgrounds. Fentanyl-related deaths are a proportion of total opioid-related deaths mapped in Figures 14-16 by year.

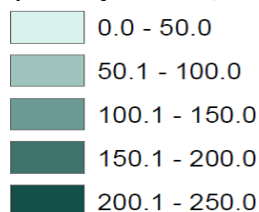
Figure 20



Calhoun County, 2015

● Fentanyl Related Death **H** Area Hospitals

Unintentional and Undetermined Opioid Overdose Emergency Department Visits (Rate per 100,000 population)



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

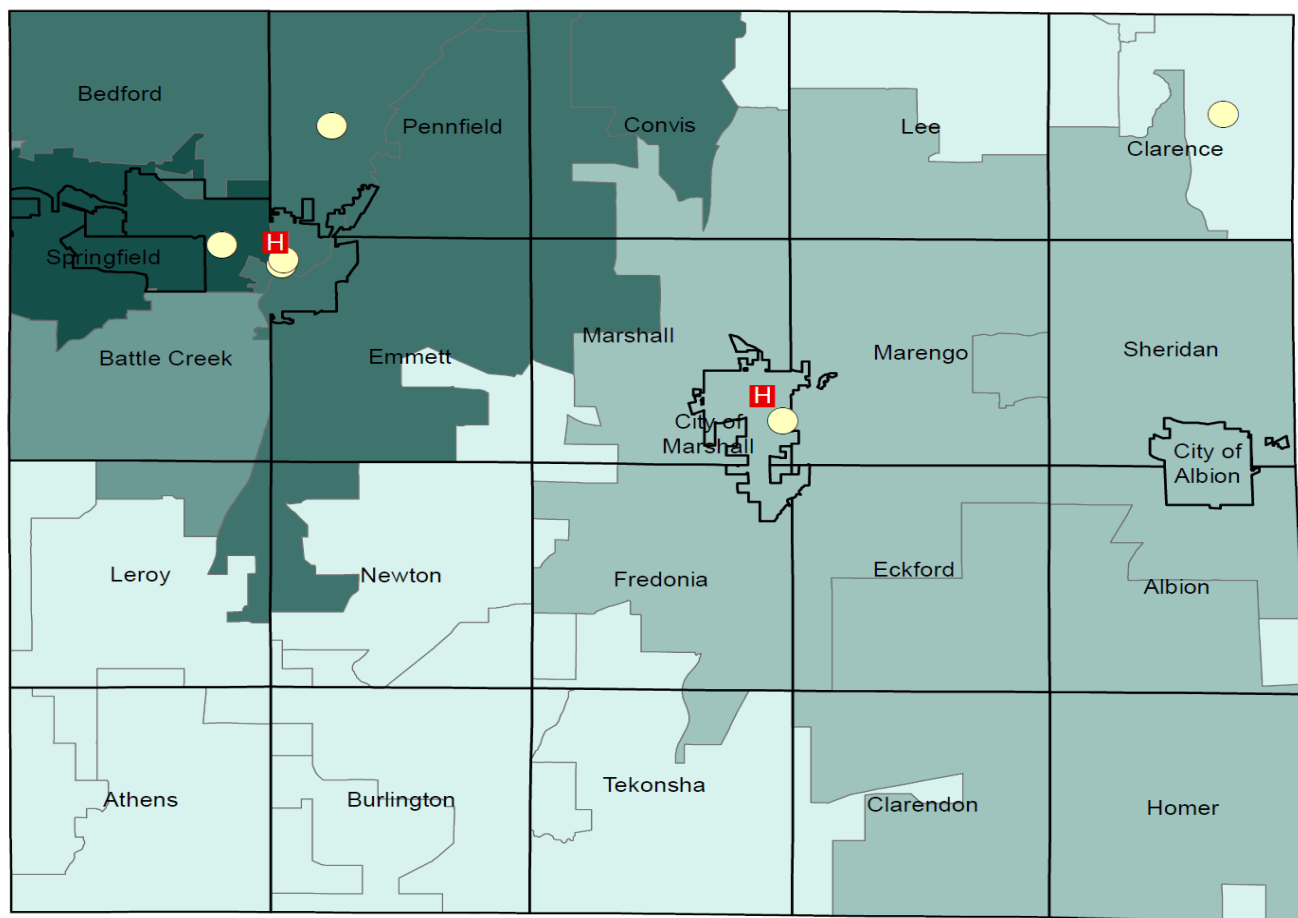
Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*0 deaths occurred at Area Hospitals

The top three zip codes with the highest rates of unintentional and undetermined opioid overdose visits to an emergency department in Calhoun County were 49037, 49017, and 49014. Figures 20-23 use fentanyl-related death locations but total opioid overdose emergency department rates as backgrounds. Fentanyl-related deaths are a proportion of total opioid-related deaths mapped in Figures 14-16 by year.

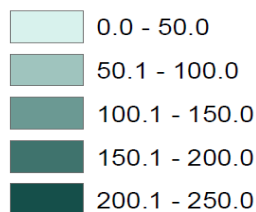
Figure 21



Calhoun County, 2016

● Fentanyl Related Death **H** Area Hospitals

Unintentional and Undetermined Opioid Overdose Emergency Department Visits (Rate per 100,000 population)



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

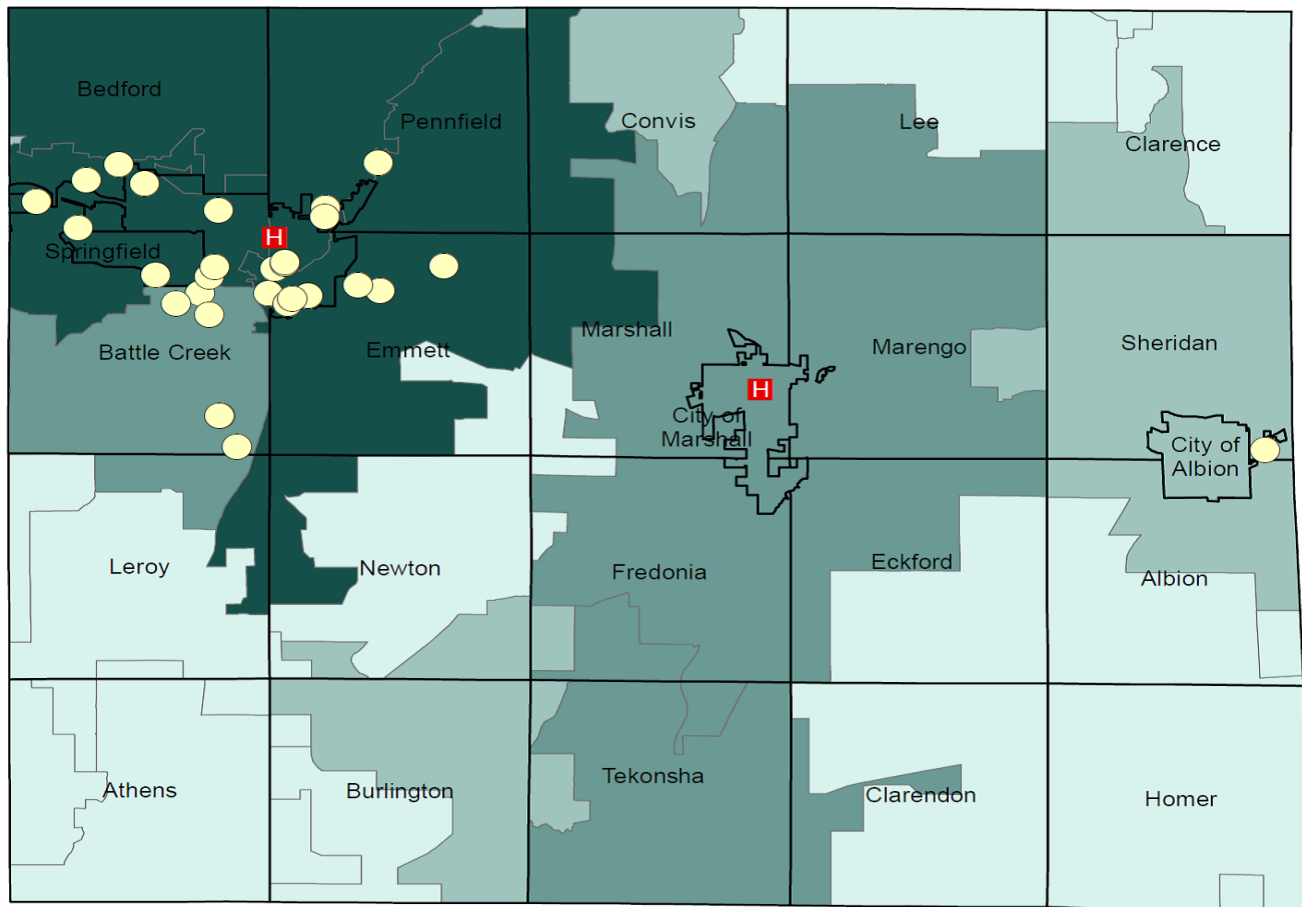
Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*3 deaths occurred at Area Hospitals

The top three zip codes with the highest rates of unintentional and undetermined opioid overdose visits to an emergency department in Calhoun County were 49037, 49017, and 49014. Figures 20-23 use fentanyl-related death locations but total opioid overdose emergency department rates as backgrounds. Fentanyl-related deaths are a proportion of total opioid-related deaths mapped in Figures 14-16 by year.

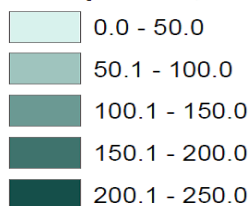
Figure 22



Calhoun County, 2017

● Fentanyl Related Death H Area Hospitals

Unintentional and Undetermined Opioid Overdose Emergency Department Visits Rate per 100,000 population



Map created by Calhoun County GIS, 2018

Data Sources: Calhoun County Office of the Medical Examiner and Area Hospitals

Population rates based on 2016 American Community Survey population estimates

*Indicated locations are address of death, not necessarily the residence of decedents

*2 deaths occurred at Area Hospitals

A strategic framework for how Calhoun County can address the opioid epidemic is shown in the figure below. The four strategic priorities include prevention and education, supply and control of opioids, treatment and harm reduction. The Calhoun County Opioid Coalition aims to coordinate and integrate existing and new efforts within these strategic priorities across Calhoun County.

Prevention and education efforts could include community and professional education on addiction as a long-term, relapsing disease of the brain, increased knowledge about opioids and increased risk perception. Prevention efforts may also focus on the upstream risk factors that influence the development of opioid addiction in community members.

Supply and control efforts involve law enforcement and improving opioid prescribing practices. New partnerships to reduce the supply of illicit drugs or the unlawful distribution of legal drugs are emerging in some communities. Improving prescribing practices of opioids requires both professional education and systems-level changes within healthcare institutions.

Prioritization of treatment is essential given the nature of addiction and the progression of the fentanyl epidemic. Treatment focuses on access and improvement of referrals across a continuum of care for opioid addiction. Access to medication-assisted treatment such as buprenorphine, methadone and naltrexone, as well as improved coordination between behavioral and mental health services and recovery services are needed. Professional education on chronic pain management as well as screening, diagnosis and early intervention for those at risk for opioid use disorder are needed to complement efforts focused on treatment and recovery.

Finally, harm reduction involves preventing overdose deaths and the spread of infectious disease associated with drug use. Overdose education and naloxone distribution includes efforts to prevent overdoses through education and administration of a drug called naloxone, which reverses an opioid overdose. Public health agencies can partner with healthcare institutions and social services to detect and prevent the spread of infectious diseases such as HIV, and Hepatitis A, B, and C, in addition to reducing blood stream and heart valve infections associated with drug use. The Calhoun County Opioid Coalition will employ Healthy People 2020's MAP-IT (Mobilize, Assess, Plan, Implement and Track) strategy as its model for improvement to address the opioid epidemic through the coordination and integration of these four strategic priorities.

Note: As of 5/30/18, all seven Calhoun County resident cases of Hepatitis A linked to the ongoing Michigan Hepatitis A outbreak involved a history of injection drug use. Four of the seven involved non-injection drug use.

