

Manner of Death and Fentanyl Related Drug Overdose Trends in Marion County, Indiana, US from 2018 to 2021

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Abstract

The purpose of this research was to investigate the manner of deaths in Marion County, throughout the years of 2018 to 2021 to see if there were any correlative increases in homicide, suicide, natural, accidental, or drug overdose related deaths. We surveyed the incidence of all deaths that occurred from 2018 through 2021 which came through the Marion County Coroner's Office, Indiana. The data was then divided into two halves. According to the data, the leading manner of death in the first half and second half was accidental. This study revealed a total of 8732 cases: 3817 of them were observed to be accidental, 3092 natural, 956 homicide, 689 suicide, and 178 were undetermined. There were initially 318 drug overdose related deaths in 2018 and they increased to 2163 by 2021. In 2018, the number of deaths due to fentanyl related overdoses increased from 195 to 799 in 2021. This research will contribute to the forensic science field by providing information about the manner of death and fentanyl trends in Marion County over the last four years.

Keywords

Drug Overdose, Fentanyl, Manner of Death

1. Introduction

Throughout the years, the number of death cases has been on the rise, partly due to newly introduced diseases and increases in accidents, homicides, and drug overdoses. This paper looks at the impact that fentanyl related drug overdoses have had on the rising number of deaths throughout the years.

Fentanyl is a synthetic opioid that has been medically used to treat chronic pain due to its fast acting and temporary effects [1]. The rise in fentanyl use is

due to the mixing of it with other compounds such as heroin, drug users not being aware of its presence, as well as the increase in usage of transdermal patches in modern medicine [2] [3] [4]. Illicit drug chemists have been synthesizing numerous fentanyl analogues in the last few years leading to many fatal overdoses. Acetyl fentanyl has been the most prominent fentanyl analogue used in the United States within recent years [2].

The purpose of this research was to investigate the manner of deaths in Marion County, Indiana throughout the years of 2018 to 2021 to see if there were any correlative increases in homicide, suicide, accidental, or undetermined deaths. In addition to those, drug overdoses and those that involved fentanyl were examined due to the increase in cases in recent years.

The data examined included information about manner, cause, and date of death. We analyzed this data from 2018 to 2021 and broke it down into two halves in order to observe the various trends in this four-year period.

2. Materials and Methods

2.1. IRB Approval

A detailed IRB approved protocol was used to collect all the data from the Marion County Coroner's Office, Indianapolis Indiana from January 2018 up through December 2021.

2.2. Manner of Death

The manner of death is an important piece of data from an examiner's documents that gives record of the context of death. There are five categories for manner of death: accidental, natural, homicide, suicide, and undetermined.

2.2.1. Accidental

Accidental is the manner of death that occurs when death due to injury is unintentional. This includes causes of death incidents such as: drug overdose, alcohol poisoning, motor vehicle accidents, industry accidents, asphyxia due to drowning, blunt force trauma injuries, head trauma, inhalation of soot and hot gases, verapamil toxicity, traumatic brain injury, carbon monoxide intoxication, 95% TBSA thermal injury, smoke inhalation with thermal burn, odontoid fracture, and mechanical asphyxia.

2.2.2. Natural

Natural is the manner of death that arises due to sickness, illness, or disease. This includes causes of death incidents such as: alcoholism, atherosclerotic hypertensive cardiovascular disease, epileptic seizure disorder, acute exacerbation, acute cardiac event, myocardial infarction, ischemic bowel, diabetes, atherosclerotic disease, GI bleed, lung cancer, pneumonia, convulsive disorder, non-viable fetus, tracheobronchitis, coronary artery disease, diabetic ketoacidosis, prostate cancer, stomach cancer, aspiration, sepsis, end stage liver disease, upper gastrointestinal bleed, rupture of esophageal varices, acute renal failure,

acute pulmonary embolism, small bowel perforation, septic shock, hypertension, prematurity-placenta abruption, cirrhosis of liver, acute bacterial peritonitis, pancreatitis, organ failure, cerebral palsy, emphysema, ulcerative colitis, appendicitis, and ulcerative colitis.

2.2.3. Homicide

Homicide is the manner of death that is due to foul play or intentional injury from another individual other than the deceased. This includes causes of death incidents such as: gunshot wounds, sharp force injuries, blunt force trauma, inhalation of heated toxic products of combustion due to arson, asphyxia due to manual suffocation and strangulation, stab wounds.

2.2.4. Suicide

Suicide is the manner of death resulted from intentional injury of the deceased to themselves.

2.2.5. Undetermined

Undetermined is the manner of death that arises when there is not enough evidence to conclude any of the other four manners.

2.3. Types of Data Collected

The occurrence of death from all cases that went through the Marion County Morgue over the four-year time period was surveyed. The data collected was a composition of the manner in which the deceased passed, the cause of death, and the date it took place. The variable investigated in this study was solely the number of deaths. We looked at how many death cases fell into each manner of death category: accidental, homicide, natural, suicide, or undetermined. As well as the number of deaths that were determined to be caused by drug overdose and those overdoses that were related to fentanyl.

All cases included in this study came from the Marion County Morgue and was based on the following criteria according to the Indiana Government website; “the context of death cases investigated by the coroner’s office includes sudden death of children, death occurring within 24 hours of admission to a hospital or health care facility, when a physician is unable to determine cause of death, if the deceased does not have a physician, known or suspected homicide, known or suspected suicide, related to or following known suspected self-induced or criminal abortion, following an accident or injury primary or contributory—old or recent, where patient dies under anesthetic, incarceration, and all deaths of unidentified persons [5]”.

2.4. Data Organization

The data from a total of 8732 cases was collected, stored, and analyzed in Microsoft Excel 2013. The data was sorted to into subcategories of death. The subcategories they were sorted into were the five manners of death: accidental, homicide, suicide, natural, and undetermined. Drug overdoses are not a part of

these subtypes but were evaluated as well. We surveyed the incidence of all deaths that occurred in the time period of consequence. The data was then divided into two six-month periods each year. Halve one (H1) contained the months January, February, March, April, May, and June. Halve two (H2) contained the months July, August, September, October, November, and December.

3. Results

3.1. 2018 to 2021 Overall

According to the data the leading manner of death was accidental. With a total of 8732 cases, 3817 were observed to be accidental, 3092 natural, 956 homicide, 689 suicide, and 178 were undetermined [6] [7] [8] [9] (**Figure 1**).

3.2. Halve 1 (H1) and Halve 2 (H2)

Figure 2 and **Figure 3** illustrate the breakdown of deaths from January 1 to December 31.

Accidental was the leading cause of death for H1 and H2 from 2018 to 2021 [6] [7] [8] [9]. In H1 of 2018 there were a total of 593 cases, in 2019 there were 989, in 2020 there were 1272, and in 2021 there were 1407 [6] [7] [8] [9]. In H2 of 2018 there were a total of 602 cases, in 2019 there were 1034, in 2020 there were 1330, and in 2021 there were 1505 [6] [7] [8] [9]. The percentage of accidental deaths in 2018 and 2021 decreased in H2. From 2019 to 2020 it was higher in H2 than H1. The percentage of suicides was the same across the year 2018. In the years 2019 and 2021 it was lower in H2, but in 2020 it was higher in H2. The percentage of natural deaths in 2018 to 2020 was lower in H2 than H1, but this flipped in 2021 and it was lower in H1 than H2. The percentage of undetermined deaths was higher in H1 from 2018 to 2021. The percentage of homicides was found to be higher in H2 across all four years in the observed period.

3.3. Drug Overdoses and Fentanyl

There were a total of 2163 deaths resulting from drug overdoses from 2018 to 2021 [6] [7] [8] [9]. Deaths resulting from drug overdose increased from 2018 to 2021. Overall, there were 318 drug overdose related deaths in 2018 and it increased to 799 deaths for the year 2021 [6] [7] [8] [9] (**Figure 4**). In this same period, there were 195 fentanyl related drug overdoses resulting in death in 2018 and it increased to 641 deaths for the year 2021 [6] [7] [8] [9] (**Figure 4**). Fentanyl intoxication causes congestion in the lungs, and this can be seen in post-mortem histology observations (**Figure 5**).

4. Discussion

4.1. Halve One and Halve Two Observations

Undetermined deaths from 2018 to 2020 were lower in halve two by around 0.36% than halve one. But in 2021 this gap increased, and undetermined deaths

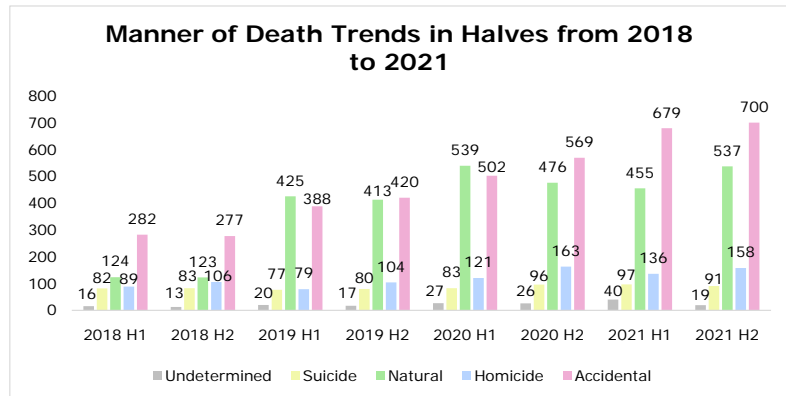


Figure 1. Manner of Deaths trend findings of half one and two of the years 2018, 2019, 2020, and 2021. Half one consisted of data from January 1st through June 30 and half two consisted of data from July 1st to December 31st.

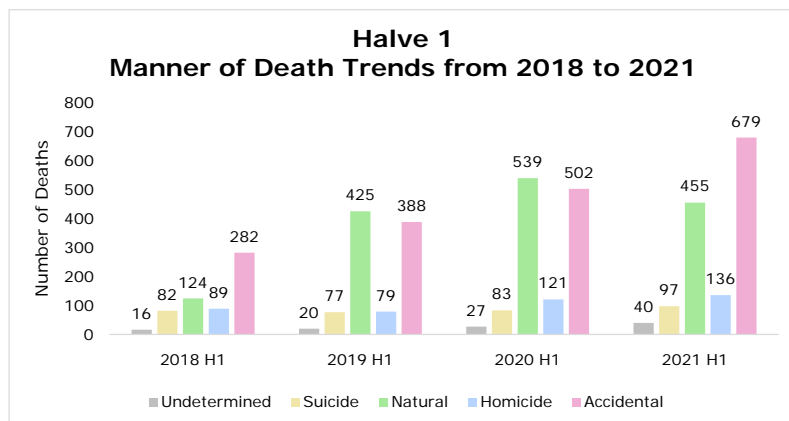


Figure 2. Manner of Deaths trend findings of half one of the years 2018, 2019, 2020, and 2021. Half one consisted of the months January, February, March, April, May, and June. Overall, in half one 2.4% of deaths were undetermined, 8% were suicide, 36.2% were natural, 10% were homicide, and 43.4% were accidental.

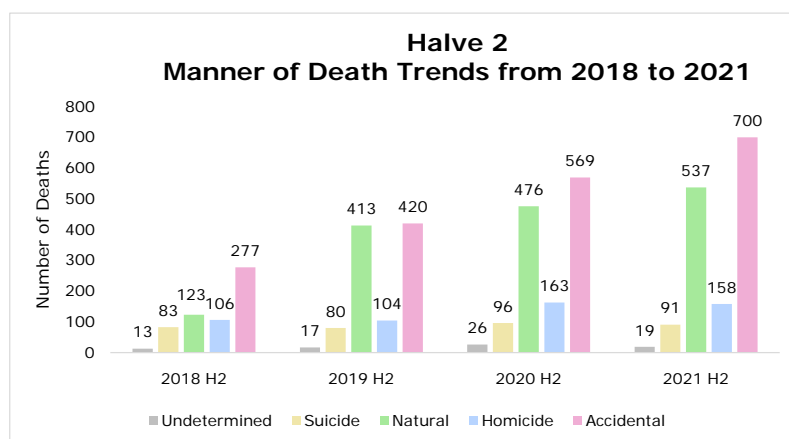


Figure 3. Manner of Deaths trend findings of half two of the years 2018, 2019, 2020, and 2021. Half two consisted of the months July, August, September, October, November, and December. Overall, in half two 1.7% of deaths were undetermined, 7.8% were suicide, 34.6% were natural, 11.9% were homicide, and 44% were accidental.

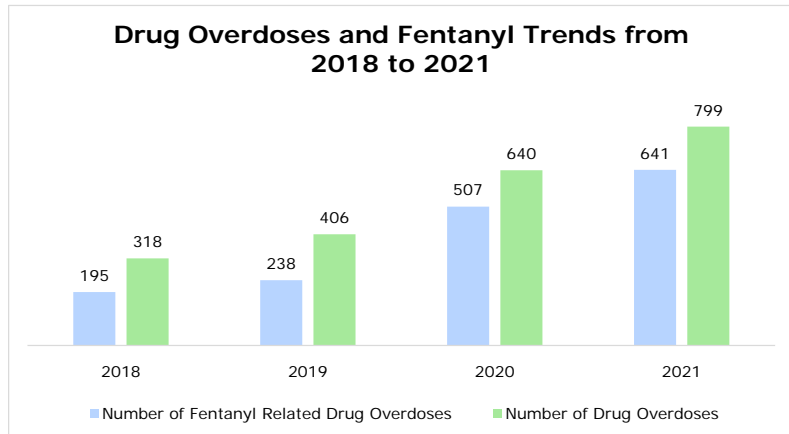


Figure 4. Drug overdose and fentanyl trend findings from 2018 to 2021. According to this data 73.1% of drug overdoses in this time period were related to fentanyl. Deaths resulting in drug overdoses increased from 26.6% of total deaths in 2018 to 27.4% in 2021.

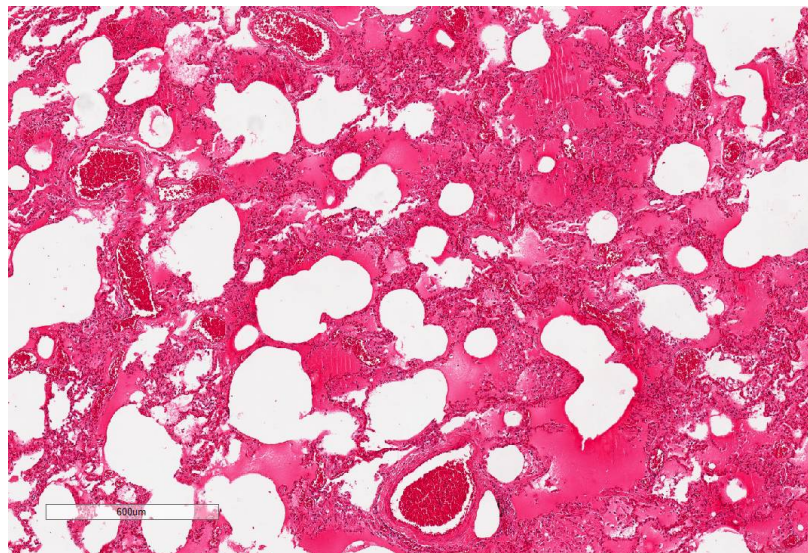


Figure 5. Photomicrograph illustrating severe congestion in the lung in a death caused by fentanyl intoxication, 10x.

were lower in half two by 1.6% than half one.

In 2018 suicides were about the same the whole year and in 2019 suicides were lower in half two by 0.04%. In 2020 suicides were lower in half one than half two by about 0.69% and by 2021 they went back to being higher in half one than half two but by 0.85%.

Natural deaths had a variation of changes throughout the observed period. In 2018 natural deaths were lower in half two than half one by 0.48%. Still in 2019 and 2020 natural deaths were lower in half two but by higher values, 3.03% and 6.6% respectively. In 2021 the trend changed, and natural deaths were higher in half two than half one by 3.3%.

From 2018 to 2020, homicides were higher in half two than half one by around 2.5%. In 2021, there was a slight change in the trend, and homicides were higher

in half two by 0.83% than half one.

Accidental deaths in 2018 and 2021 were lower in half two than half one by about 1.6%. While in 2019 and 2020, they were higher in half two than half one by 1.4% and 3.3% respectively.

4.2. Relation to Previous Suicidality Studies

A previous study on suicidality stated that, in 2001 to 2005 “64% of the injury deaths were unintentional (accidental), 21% of the deaths resulted from suicide, 11% from homicide, and 3% were undetermined” [10]. Our data shows that there was a shift in these statistics for Marion County, Indiana. From 2018 to 2021, 43% of deaths were accidental, 35% were natural, 10% were homicide, 8% were suicide, and 2% were undetermined. Over this four-year period, accidental, suicide, homicide, and undetermined deaths appeared to have decreased compared to the previous study done for the years 2001 to 2005.

4.3. Comparison with Fentanyl Related Overdose in Indianapolis: Estimating Trends Using Multilevel Bayesian Models to Real Results

The results from this research done in the article determined that fentanyl would contribute to 23% of overdoses from 2010 to 2017 [11]. Our results over the four-year period of 2018 to 2021, display a total of 1581 drug overdoses that involved fentanyl. The presumption of an increasing trend of fentanyl related overdoses was verified. Moreover, from 2018 to 2021 the increasing trend continued, and it was found that 73% percent of drug overdoses were related to fentanyl. This increasing trend in fentanyl related drug overdoses was also seen in other publications [12] [13].

Limitations to this data are that not every single death case in Marion County was a part of this data, due to the intake criteria of the Marion County Morgue. This included natural deaths that have occurred at home, in the hospital, or at assisted living facilities where individuals were living for a prolonged period of time.

5. Conclusion

In the years 2018 to 2021, more death cases occurred in the second half of the year. Accidental death was the leading cause of death. Also, drug overdoses were responsible for 26.6% of deaths in 2018 and 27.4% of deaths in 2021. Fentanyl related drug overdoses resulted in death increased from 195 cases in 2018 to a total of 1581 cases throughout the observed four-year period by 2021.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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