2023

An Analysis of the Role of Fentanyl in Fatal Overdoses in Orange County

Logan Michalski
University of Central Florida

AN ANALYSIS OF THE ROLE OF FENTANYL IN FATAL OVERDOSES IN ORANGE COUNTY

by

LOGAN MICHALSKI

A thesis submitted in partial fulfillment of the requirements
for the Honors Undergraduate Thesis program in Sociology
in the College of Sciences
and in the Burnett Honors College
at the University of Central Florida
Orlando, FL

Spring Term
2023

Thesis Chair: Amy Donley, Ph.D.

ABSTRACT

Fentanyl is a potent narcotic analgesic that leads to countless overdoses each year. Past studies have shown that fentanyl use has been growing substantially in counties within Florida. However, little research has been done to quantify and analyze rates of fentanyl overdose within Orange County, particularly over multiple year periods of time. The goal of this study is to provide information and analysis on the rates of fentanyl overdose within Orange County, Florida from 2019 to 2021, and to explore demographic factors that correlate with fentanyl overdose. It is hypothesized that the rate of fentanyl overdoses will have significantly increased yearly from 2019 to 2021. Additionally, it is expected that a significant portion (20% or more) of decedents will have other drugs identified by the Medical Examiner within their systems. Lastly, it is predicted that there will be a statistically significant difference in fentanyl overdose rates between demographic groups.

ACKNOWLEDGEMENTS

I would like to thank my thesis chair, Dr. Amy Donley, for giving me the opportunity to write this thesis and her endless support and mentorship along the way. I would also like to thank Dr. Jason Ford, my other committee member, for dedicating his time to reviewing various drafts and offering his insights. Lastly, I would like to thank my friends and family for their support and encouragement throughout this process.

TABLE OF CONTENTS

LIST OF TABLES v

INTRODUCTION 1

LITERATURE REVIEW 3

METHODS 7

RESULTS 8

DISCUSSION 13

CONCLUSION 15

REFERENCES 17

LIST OF TABLES

Table 1. Coverage of Overdoses by Decedent Characteristics (N=1353) 8

Table 2. Total number of overdose decedents and percent change by year (N=1353)..... 9

Table 3. Total number of fentanyl-related overdose decedents and percent change by year (N=1012)..... 9

Table 4. Percentage of total overdoses fentanyl-related per year (N=1353) 9

Table 5. Percentage of Decedents by Drug Category 10

Table 6. Cross-Tabulation between Drug Type and Gender 10

Table 7. Cross-Tabulation between Drug Type and Race 11

Table 8. Cross-Tabulation between Drug Type and Housing Status..... 12

INTRODUCTION

Fentanyl is a potent, narcotic analgesic opioid that was first synthesized in 1960 by Dr. Paul Janssen of Belgium. Dr. Janssen sought to synthetically develop narcotic analgesics that were stronger than others currently available, and his work ultimately led to the development of the drug known as fentanyl. Fentanyl is estimated to be 100 to 300 times stronger than morphine (Stanley, 1999). However, due to its extreme potency, microscopic doses of fentanyl can lead to a fatal overdose.

This thesis explores the role of fentanyl in fatal overdoses in Orange County, Florida. While previous research has been done on fentanyl overdose and fatalities both nationwide and in the state of Florida as a whole, limited literature exists focusing singularly on Orange County, the 5th most populous county in Florida with over 1.4 million residents ("Florida Counties by Population," 2022). It is also notable to mention that Orange County is the home to various theme parks and other tourist attractions, making it an area of high traffic that many visit and spend time in. This lack of literature focusing on Orange County makes analysis of fatal fentanyl overdoses in Orange County a valuable and informative endeavor. Specifically, no literature has been written that covers fatal fentanyl overdoses in Orange County through the year 2021.

This thesis examines the number of fatal fentanyl overdoses yearly from 2019 to 2021 in Orange County, Florida, utilizing data from the Orange County Medical Examiner's Office. The analysis here focuses on demographic trends and the role fentanyl played in the fatal overdoses, but further studies will need to be performed to gain a better understanding of the background behind fatal fentanyl overdoses in Orange County. This study primarily concerns itself with a

general analysis of the rates and yearly numerical trends of fatal fentanyl overdose in Orange County. Additionally, cases of fatal overdose of fentanyl in the presence of other drugs were examined and compared to the number of fatal overdoses due purely to fentanyl by year. Lastly, demographic analysis of the rates of overdose between fentanyl and other classes of drugs were performed.

LITERATURE REVIEW

It is important to understand the structure, potency, and analogs of fentanyl to be able to perform research on the rates of overdose and demographics behind fentanyl use. Fortunately, extensive research has been done on these three factors. Chemical studies have shown the exact structure of fentanyl and how this relates to its extreme potency of being 50-100 times stronger than morphine and 30-50 times stronger than heroin. In addition, chemical analysis has shown that carfentanil, a synthetic fentanyl analog, is 10,000 times more potent than morphine and 100 times more potent than standard fentanyl (Swanson, Hair & Rivers, 2017). Other studies showed that there are upwards of 19 synthetic fentanyl derivatives, contributing to the illicit availability of fentanyl-related drugs and subsequent increases in fentanyl-related overdose (Fogarty, Papsun & Logan, 2018).

Second, it is important to understand how medical data are collected, distributed, and reported in studies that analyze fatal fentanyl overdose rates and demographics. A standard way of receiving medical data, particularly in Florida, is the use of the Medical Examiner Office. The Medical Examiner Office (MEO) is responsible for determining cause of death, performing autopsies, and submitting samples to toxicology laboratories. It is then the job of the toxicology laboratory to prepare a list of substances found and report this data back to the MEO with the goal of determining cause of death (Powell, 2019). For this proposed thesis on the role of fentanyl in fatal overdoses in Orange County from 2017 to 2021, data from the Medical

Examiner Office will be used. Thus, it is important to have sufficient background knowledge on the roles and methods of the MEO in both collecting and reporting data.

Studies done on drugs other than fentanyl can also give insight on the validity and importance of studying the trend of fentanyl drug use in Orange County. In particular, a similar study examined the trends of heroin usage in Orange County from 2010 to 2014, using Florida Medical Examiner data (Hudson, Klekamp & Matthews, 2017). Although this study does not directly relate to fentanyl use, it uses similar research methods and data collection strategies. This validates that conclusions and statistics of drug overdose rates can be drawn from examination Medical Examiner Office data.

A single nationwide study from 2023 found disparities between race and fentanyl use. This study found that in 2020, crude fentanyl overdose rates for both black females and black males were higher than their white counterparts. Additionally, when analyzing 2020 fentanyl overdose rates, this study found that trends between gender were consistent and that there were no observed differences between males and females (D'Orsogna, Böttcher & Chou, 2023). These findings and methods are significant as they provide a background of research that this thesis will be able to compare to. This thesis will also look at relationships between fatal fentanyl overdose and gender and race, albeit only within Orange County, Florida, from 2019 to 2021. Additionally, this thesis will also look at relationships between fentanyl and housed status, something the aforementioned study did not explore.

Perhaps most relevant, a single study has been conducted on fatal overdoses in 2020 in Orange County, Florida (Hall & Donley, 2021). While not specifically considering fentanyl overdoses, this study provides a basis for overdose research within Orange County and used

similar methods as proposed for this thesis. This thesis expands upon previous overdose research within Orange County by focusing specifically on fentanyl overdose over a longer time range, from 2019 to 2021, and by examining the role of fentanyl in combination with other drugs.

Lastly, numerous studies have been done on fentanyl usage and overdose in individual counties across the state of Florida and in the state of Florida as a whole. These studies demonstrate the gravity of the situation throughout the years and show the need for continued analysis of recent trends of fatal fentanyl use both in Orange County and Florida as a whole.

As a whole, studies have shown that trends in drug use, both licit and illicit, including fentanyl have increased substantially in Florida. One such study examined fentanyl use from 2001 to 2012 and found an increase of 16.4% from 2010 to 2012 compared to the previous three-year period (Lee & Delcher, 2014). This study affirms the observation that fentanyl use seems to be on the rise, and that further examination into rates of use and overdose is warranted. Similarly, a study of fentanyl-related overdose deaths in both Florida and Ohio showed a significantly positive percent change in the rates of fatal fentanyl overdose in the years from 2010-2014 and gave a graphic representation of fentanyl overdoses monthly from January 2013 to June 2015. This graphic showed that fentanyl-related overdose deaths increased almost 3-fold in this short period (Peterson, Gladden & Delcher, 2016). A 2017 analysis of fentanyl and fentanyl related analog usage and overdose in Hillsborough County, Florida, showed that fentanyl and its analogs played a significant role in tripling fatal overdose rates from 2014-2016 within the county, and statistically showed that even microdoses of fentanyl and its analogs can result in fatal overdose (Swanson, Hair & Rivers, 2017). Rises in fentanyl overdoses have also been associated with increased rates of illicitly manufactured fentanyl (IMF). Compared to

acquiring fentanyl legally with a prescription, IMF production is significantly linked to rapid increases in fentanyl mortality, expressing a need for increased fentanyl overdose surveillance through an analysis of recent Medical Examiner data (Peterson, Gladden & Delcher, 2016).

In summation, previously written literature confirms the need for continued analysis of fentanyl overdose and shows gaps in data collection, particularly in Orange County, Florida. This thesis begins to fill that gap and provides an in-depth analysis of the role of fentanyl in fatal overdoses in Orange County. Fentanyl has been demonstrated to be a rising problem in previously written literature, justifying the need for additional research. Additionally, previous research has used similar methodology compared to proposed methods for this thesis, ensuring the validity of methods used.

METHODS

Fatal overdoses related to fentanyl were examined using Orange County Medical Examiner data. Data were provided in an Excel file and included information about the sex, age, race, address, and toxicology reports of the decedents. The data were imported into SPSS for statistical analysis. All data used is de-identified and the research includes no living human subjects.

The research questions for the study are: How has the rate of fatal fentanyl overdoses changed yearly from 2019 to 2021? Is the rate of fatal fentanyl overdoses following an upward trend? What percentage of fatal fentanyl overdoses from 2019 to 2021 also included other drugs in the deceased's system? Are there any demographic correlations that can explain rates of fentanyl overdose?

Hypotheses: From 2019 to 2021, fentanyl overdoses have increased yearly. The rate of fentanyl overdoses has followed an upward trend from 2019 to 2021. A significant portion (20% or more) of fatal fentanyl overdoses also included other drugs in the systems of the deceased.

RESULTS

General Demographics of Overdose Decedents

Table 1 shows various demographic characteristics of all reported drug decedents from 2019 to 2021. The data shows that decedents are overwhelmingly male, white, and housed. A small percentage of decedents' race was not reported by the Medical Examiner, and therefore was coded as missing. Likewise, a small portion of decedents were not reported to be either homeless or housed and have been coded as missing as well.

Table 1. Coverage of Overdoses by Decedent Characteristics (N=1353)

	n	%
Gender		
Male	1061	78.4
Female	292	21.6
Total	1353	100.0
Race		
Black	197	14.6
White	1090	80.8
Other / Unknown	66	4.9
Total	1353	100.0
Homeless Status		
Yes	130	9.6
No	1219	90.1
Missing*	4	0.3
Total	1353	100.0

*Characteristic missing or not listed within Medical Examiner data.

Fentanyl is a Growing Problem in Orange County

As shown in Table 2, drug overdoses within Orange County consistently increased from 2019 to 2021, with 174 more overdoses in 2021 compared to 2019. Table 3 shows the total number of fentanyl related overdoses per year as well as the percent change by year, highlighting that

fentanyl overdose has been a rapidly growing problem within Orange County. Furthermore, Table 4 provides figures that emphasize that fentanyl increasingly became a more significant portion of all drug overdoses in the given time frame. Alarmingly, each year the percent change in fentanyl overdoses outpaced the percent change in general drug overdose. Similarly, the percentage of all drug overdoses involving fentanyl use has consistently increased from year to year, with a peak of 78.7% in 2021.

Table 2. Total number of overdose decedents and percent change by year (N=1353)

	n	% change
2019	365	--
2020	449	+23.0
2021	539	+20.0
Total	1353	

Note: Percent change has been rounded to nearest tenth.

Table 3. Total number of fentanyl-related overdose decedents and percent change by year (N=1012)

	n	% change
2019	244	--
2020	344	+41.0
2021	424	+23.3
Total	1012	

Note: Percent change has been rounded to nearest tenth.

Table 4. Percentage of total overdoses fentanyl-related per year (N=1353)

	%
2019	66.8
2020	76.6
2021	78.7

Note: Percentage values have been rounded to nearest tenth.

Differences Based on Gender

Of the 1353 total reported decedents, 1061 were male and 292 were female. As shown in Table 6, there are no significant statistical differences between the decedent drug type and gender of the decedent. A comparable percentage of decedents from each gender are seen in each drug type. However, it is worth noting that decedents overwhelmingly died from an overdose of pure fentanyl or a poly-fentanyl substance. Other opioids combined with poly opioid substances were the least frequent cause of death between both genders, with other drugs or a mixture of other drugs not containing opioids being less prevalent than fentanyl-related substances but more frequent than other opioid overdoses.

Table 5. Percentage of Decedents by Drug Category

	%
Fentanyl	22.6
Poly fentanyl	52.7
Opioid	2.5
Poly opioid	5.4
Other (non-opioid)	13.6
Poly other	3.2
Total	100.0

*Percentage values have been rounded to nearest tenth.

Table 6. Cross-Tabulation between Drug Type and Gender*

	Men	Women	Total
Fentanyl + poly-fentanyl	76	72	75
Opioid + poly opioid	7	11	8
Other drug + poly (no opioid)	17	17	17
Total	100	100	100

Note: Figures are percentages. Percentages may not total to 100% due to rounding errors.
*$\chi^2 = 4.248$, p = n.s.

Differences Based on Race

Of the 1353 reported decedents, 197 were black, 1090 were white, and 66 were listed as either unknown or the data was missing. Decedents designated as unknown or missing were not included in the cross-tabulation between drug category and race as no conclusions could be drawn on a group whose characteristics are unknown or ambiguous. As shown in Table 7, there are statistically significant differences between drug type and race. Where 78% of white decedents overdosed from fentanyl or poly fentanyl substances, only 65% of black decedents did the same. Contrastingly, black decedents were over two times more likely to overdose from substances not containing opioids, while white decedents were over two times more likely to overdose from opioid and poly opioid substances. While fentanyl and poly fentanyl substances were the primary cause of death of both races, significant differences between drug categories can still be seen in the percentage of decedents from each race.

Table 7. Cross-Tabulation between Drug Type and Race*

	White	Black	Total
Fentanyl + poly-fentanyl	78	65	76
Opioid + poly opioid	9	4	8
Other drug + poly no opioid	14	31	17
Total	100	100	100

Note: Figures are percentages. Percentages may not total to 100% due to rounding errors.
*$\chi^2 = 37.916$, $p < .001$

Differences Based on Homeless Status

Although an overwhelming majority of decedents were designated as housed, significant differences were seen between housed and unhoused individuals. As shown in Table 8, opioid and poly opioid drug overdose was much more common among housed decedents as compared

to those experiencing homelessness at the time of their death. Contrastingly, prevalence of both fentanyl-related and non-opioid related overdoses are comparable between the two groups.

Table 8. Cross-Tabulation between Drug Type and Housing Status*

	Housed	Unhoused	Total
Fentanyl + poly-fentanyl	75	80	76
Opioid + poly opioid	9	2	8
Other drug + poly no opioid	16	19	17
Total	100	100	100

Note: Figures are percentages.
Percentages may not total to 100% due to rounding errors.
*$\chi^2 = 8.033$, $p < .018$

DISCUSSION

As shown by the data, overdose decedents from 2019 to 2021 in Orange County, Florida were overwhelmingly white, male, and housed. However, differences were analyzed between these three demographic groups and overdose drug categories. In terms of sex, we see no statistically significant differences within the given data set, as both males and females overdosed from each drug category at a similar percentage of incidence. However, statistically significant differences were seen when looking at race, as whites were more likely to overdose from fentanyl and poly-fentanyl substances as well as other opioid substances, whereas blacks were far more likely to overdose from non-opioid related substances. Although the majority of decedents were housed, statistical significance in overdoses between drug categories was still reported when comparing the housed and unhoused groups. The unhoused were far less likely to overdose from non-fentanyl opioid or poly opioid substances. However, rates of overdose between the other two drug categories of fentanyl and non-opioid substances were comparable between the two groups.

Perhaps most alarmingly, the rates of overdose by fentanyl or poly-fentanyl drug combinations consistently increased from the period of 2019 to 2021. Overdose by fentanyl or poly-fentanyl substances significantly outgrew the total percent change in overdoses from year to year, indicating that fentanyl overdose is only becoming a more potent and deadly issue. Therefore, it is important that studies into fentanyl overdose and use be continued as new data sets arise, and potential intervention plans are devised and eventually implemented in order to halt this growing problem. Although the COVID-19 pandemic became widespread in the United

States and Florida in early 2020, it is impossible with current data to conclude whether the pandemic is a driving factor for the increase in fentanyl-related overdoses in Orange County from 2019 to 2021. Further longitudinal study may provide insight to this topic.

CONCLUSION

From this study, we learned that fentanyl and poly fentanyl substances were the most frequent drugs seen in overdose decedents within Orange County, Florida from 2019 to 2021. We also learned that there were both similarities and differences in fentanyl overdose rates between demographic groups. While gender and homeless status had no correlation with a difference in the presence of fentanyl in decedents, significant differences were seen between races. Whites were more likely to overdose with fentanyl, poly fentanyl, or other opioid substances, whereas blacks were far more likely to overdose from non-opioid drugs. A steady increase in the number of fentanyl overdoses between years was seen, as well as a steady increase in the percent change of fentanyl overdoses per year. In order to slow and hopefully eliminate the occurrence of fentanyl overdose within Orange County, it is necessary to spread awareness of the problem. Campaigns dedicated towards both the deadliness and increased use of fentanyl within Orange County can be brought forth, raising awareness of this growing problem within our community. Additionally, awareness of the existence of Narcan is a possible solution to slow the rates of overdose of not just fentanyl, but all drugs. Narcan has recently been approved to be sold over the counter, making its availability and benefits more widespread. Spreading awareness of the increased availability of Narcan is another viable way to prevent death and cull the problem of overdose within Orange County, Florida.

While raising awareness of the danger of fentanyl and availability of Narcan may lower the rates of fentanyl overdose over time, it is important to put safety of individuals as a priority and to establish harm reduction protocols. Such measures may include implementing controlled

use sites for those suffering from drug addictions where medical professionals are on sight to provide treatment if necessary or making fentanyl test strips both legal to obtain and more widespread. Methods and resources to promote safety of individuals and prevent fatal overdoses can be implemented to make immediate change, whereas raising awareness of the lethality of fentanyl and availability of Narcan are more long-term processes that will take time to impact change.

REFERENCES

D'Orsogna MR, Böttcher L, Chou T (2023) Fentanyl-driven acceleration of racial, gender and geographical disparities in drug overdose deaths in the United States. PLOS Global Public Health 3(3): e0000769. https://doi.org/10.1371/journal.pgph.0000769

Florida Counties by Population. (n.d.). Retrieved November 4, 2022, from https://www.florida-demographics.com/counties_by_population

Fogarty, M. F., Papsun, D. M., & Logan, B. K. (2018). Analysis of Fentanyl and 18 Novel Fentanyl Analogs and Metabolites by LC–MS-MS, and report of Fatalities Associated with Methoxyacetylfentanyl and Cyclopropylfentanyl. *Journal of Analytical Toxicology*, *42*(9), 592–604. https://doi.org/10.1093/jat/bky035

Hall, B., & Donley, A. (2021). Demographic Analysis on 2020 Fatal Overdose Deaths in Orange County, FL. *Institute for Social and Behavioral Science* Retrieved from https://stars.library.ucf.edu/isbs/6

Hudson, T.-M. L., Klekamp, B. G., & Matthews, S. D. (2017). Local public health surveillance of heroin-related morbidity and mortality, Orange County, Florida, 2010-2014. Public Health Reports, 132). https://doi.org/10.1177/0033354917709783

Lee, D., Delcher, C., Maldonado-Molina, M. M., Bazydlo, L. A. L., Thogmartin, J. R., & Goldberger, B. A. (2014). Trends in licit and illicit drug-related deaths in Florida from 2001 to 2012. Forensic Science International, 245, 178–186. https://doi.org/10.1016/j.forsciint.2014.10.024

Peterson, A. B., Gladden, R. M., Delcher, C., Spies, E., Garcia-Williams, A., Wang, Y.,

Halpin, J., Zibbell, J., McCarty, C. L., DeFiore-Hyrmer, J., DiOrio, M., & Goldberger, B. A. (2016). Increases in Fentanyl-Related Overdose Deaths — Florida and Ohio, 2013–2015. *MMWR. Morbidity and Mortality Weekly Report*, *65*(33), 844–849. https://doi.org/10.15585/mmwr.mm6533a3

Powell, A. T. (2019). *A Retrospective Study of the Opioid Epidemic and Fentanyl Related Overdose Fatality Cases in a Florida West Coast Medical Examiner District Population* (Order No. 13856477). Available from ProQuest Dissertations & Theses A&I; ProQuest Dissertations & Theses Global. (2240081998). https://www.proquest.com/dissertations-theses/retrospective-study-opioid-epidemic-fentanyl/docview/2240081998/se-2

Stanley, T. H. (1992). The history and development of the fentanyl series. *Journal of Pain and Symptom Management*, *7*(3), S3–S7. https://doi.org/10.1016/0885-3924(92)90047-l

Swanson, D. M., Hair, L. S., Strauch Rivers, S. R., Smyth, B. C., Brogan, S. C., Ventoso, A. D., Vaccaro, S. L., & Pearson, J. M. (2017). Fatalities Involving Carfentanil and Furanyl Fentanyl: Two Case Reports. *Journal of Analytical Toxicology*, *41*(6), 498–502. https://doi.org/10.1093/jat/bkx037