



Research Article

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Update2: Correlation Of Fentanyl Positive Drug Screens with Other Illicit Drugs in Patients from Pain, Rehabilitation and Behavioral Programs

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Received Date: November 03, 2023

Published Date: November 28, 2023

Abstract

Objective: To monitor polydrug substance abuse over past eight years.

Method: Calculate percent of fentanyl and other drugs positive in urine drug tests.

Results: Percent of fentanyl positive drug tests increased, but increases in fentanyl/cocaine, fentanyl/methamphetamine, fentanyl/6acetylmorphine and fentanyl/marijuana were observed. The incidence of oxycodone laced with fentanyl did not increase.

Conclusion: Poly substance abuse of illicit drugs over time is increasing.

Introduction

The National Center for drug abuse statistics indicated an increase in drug overdose deaths during the past few years. They reported 96,779 drug overdose deaths from March 2020 to March 2021 [1]. This was a considerable increase compared to earlier compilations. In part these overdoses were ascribed to the presence of fentanyl at the time of death. However, our drug test data indicated that in many of our patients we have observed that more than one illicit drug was present along with fentanyl [2,3]. We considered that polysubstance abuse could be contributing to the increased overdose deaths. For example, in one newspaper article, it was noted that 6 army cadets were overdosed on fentanyl laced cocaine [4]. The CDC has warned that fentanyl has been found in a variety of products [1-9].

We had published our findings on the incidence of fentanyl laced in cocaine (benzoylecgonine), 6-monoacetyl morphine (heroin),

methamphetamine, THCA, and oxycodone as of the year 2019 [6]. Using the more than 3.5 million drug tests performed from 2016 to 2023, we were able to track the incidence of fentanyl in other illicit drug positive tests in these test urines to establish if polydrug abuse had increased in the past few years. In addition, we examined patients prescribed methadone or buprenorphine treatment for substance abuse who also used fentanyl.

Materials and Methods

From April 1, 2016, to July 31, 2023 we performed comprehensive drug tests on 3,706,299 urine specimens submitted by pain, addiction treatment, and behavioral clinics across the United States. The study was approved by WCG IRB Puyallup, WA. The method of analysis has been described by Krock, K, et al. [6]. The cutoff for defining a positive test was the same over all eight years.

The de-identified data for positive morphine- fentanyl, 6-monoacetylmorphine (6-MAM)-fentanyl, benzoylcegonine-fentanyl, methamphetamine-fentanyl-methadone-fentanyl, buprenorphine-fentanyl, and 11-Nor-9-carboxy- Δ 9-tetrahydrocannabinol (THC-A)-fentanyl was extracted. The percentages per yearly period were determined for results indicating the prevalence of fentanyl positive in the presence these drugs. The data from the LC-MS/MS instruments was downloaded from the Indigo ASCENDTM software into an Excel file which was then visualized using Microsoft Power BITM software [8]. We calculated the mean values for the test drug, fentanyl and percent co-drug positive as well as the standard deviation for these parameters.

Results

Based on >3million test results. We examined the correlation between fentanyl and the drugs, cocaine (benzoylcegonine), methamphetamine, 6 monoacetyl morphine (heroin), marijuana, (THCA) and oxycodone over the years 2016 to 2023.

Table 1: Fentanyl positives.

Year	Total Pos for Primary Analyte	Total Specimens	% of Total Pos Against Total Specimens
2023	22,295	422,684	5.3%
2022	35,013	751,646	4.7%
2021	27,941	628,141	4.4%
2020	20,374	484,717	4.2%
2019	17,552	546,953	3.2%
2018	14,469	417,423	3.5%
2017	10,262	265,820	3.9%
2016	5,135	188,915	2.7%
Total	153,041	3,706,299	4.1%

Table 2: Fentanyl cocaine.

Year	Total Pos for Primary Analyte	Total Pos for Secondary Analyte(s)	% of Positives
2023	15,337	4,535	29.6%
2022	25,882	7,457	28.8%
2021	23,247	6,766	29.1%
2020	20,817	5,588	26.8%
2019	26,079	5,260	20.2%
2018	25,904	4,407	17.0%
2017	23,471	3,296	14.0%
2016	15,555	1,519	9.8%
Total	176,292	38,828	22.0%

Table 3: Fentanyl Methamphetamine.

Year	Total Pos for Primary Analyte	Total Pos for Secondary Analyte(s)	% of Positives
2023	30,217	10,170	33.7%
2022	49,543	14,421	29.1%
2021	40,151	9,598	23.9%
2020	34,453	5,512	16.0%

The presence of fentanyl as a percent of specimens tested is shown in Figure 1 & Table 1. There was a definite increase in the years from 2016 to 2023. The polypharmacy of fentanyl with other drugs posted an increase of polysubstance abuse, with benzoylcegonine, methamphetamine, 6-MAM, oxycodone and THCA. These are expressed in Figures 2-6 and the associated Tables 2-6. From April 2016 to July 2023, we found a yearly percent increased combination fentanyl and benzoylcegonine (cocaine) which ranged from 6.8% in 2016 to 29.8% in 2023 (Figure 2 & Table 2). There was also a large increase in the percent positive fentanyl in methamphetamine positive specimens (Figure 3 & Table 3). These went from about 4.5% to about 33% in this time frame. The fentanyl positivity in the 6-MAM data increased from about 25% in 2016 to 50% in 2023 (Figure 4 & Table 4).

There was little change in the percent of fentanyl in oxycodone positive specimens (Figure 5 & Table 5). These ranged around 4% 14%. However, there was a large increase in fentanyl positives in those specimens positive for THCA (Figure 6 & Table 6). This went from about 3.6% to about 9%.

2019	37,031	2,940	7.9%
2018	24,615	1,680	6.8%
2017	14,346	946	6.6%
2016	8,152	368	4.5%
Total	238,508	45,635	19.1%

Table 4: Fentanyl 6 acetyl morphine.

Year	Total Pos for Primary Analyte	Total Pos for Secondary Analyte(s)	% of Positives
2023	1,997	995	49.8%
2022	4,192	2,133	50.9%
2021	5,810	2,809	48.3%
2020	7,752	2,767	35.7%
2019	8,893	2,660	29.9%
2018	8,624	2,676	31.0%
2017	8,816	2,719	30.8%
2016	6,500	1,598	24.6%
Total	52,584	18,357	34.9%

Table 5: Fentanyl oxycodone.

Year	Total Pos for Primary Analyte	Total Pos for Secondary Analyte(s)	% of Positives
2023	45,084	1,544	3.4%
2022	78,908	3,052	3.9%
2021	71,505	3,204	4.5%
2020	57,991	2,675	4.6%
2019	64,776	2,666	4.1%
2018	51,685	2,756	5.3%
2017	32,244	1,743	5.4%
2016	22,127	1,028	4.6%
Total	424,320	18,668	4.4%

Table 6: Fentanyl and THCA.

Year	Total Pos for Primary Analyte	Total Pos for Secondary Analyte(s)	% of Positives
2023	64,150	5,775	9.0%
2022	116,933	9,686	8.3%
2021	95,995	7,938	8.3%
2020	70,074	5,140	7.3%
2019	73,091	3,173	4.3%
2018	54,635	2,214	4.1%
2017	31,300	1,522	4.9%
2016	19,928	709	3.6%
Total	526,106	36,157	6.9%

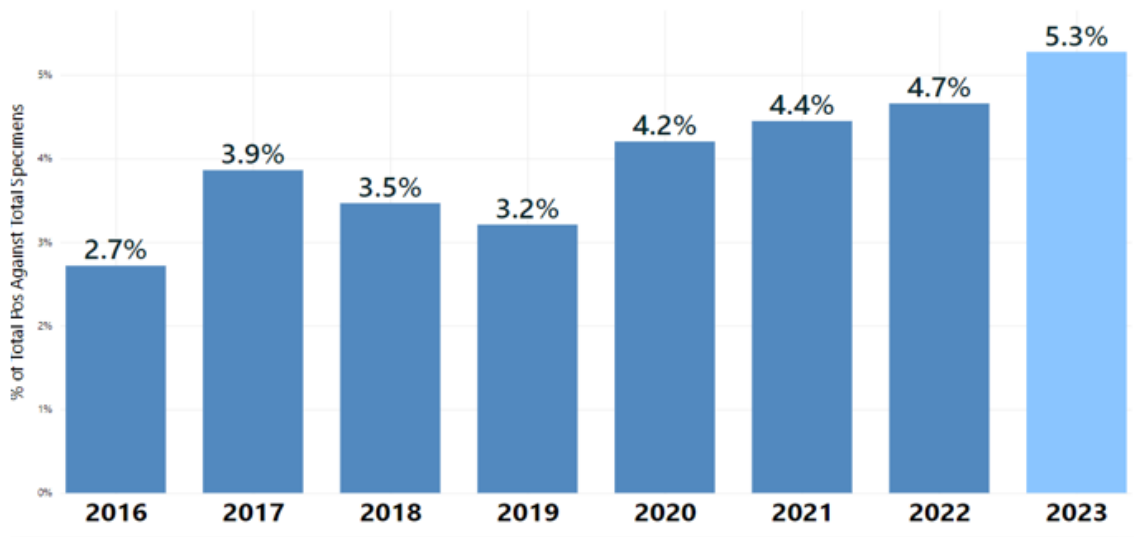


Figure 1: Fentanyl positives.

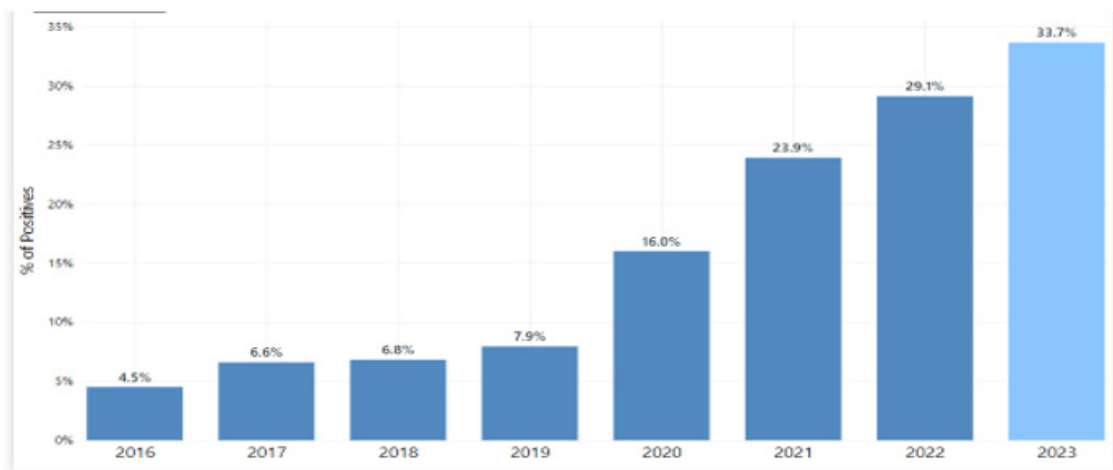


Figure 2: Fentanyl cocaine.

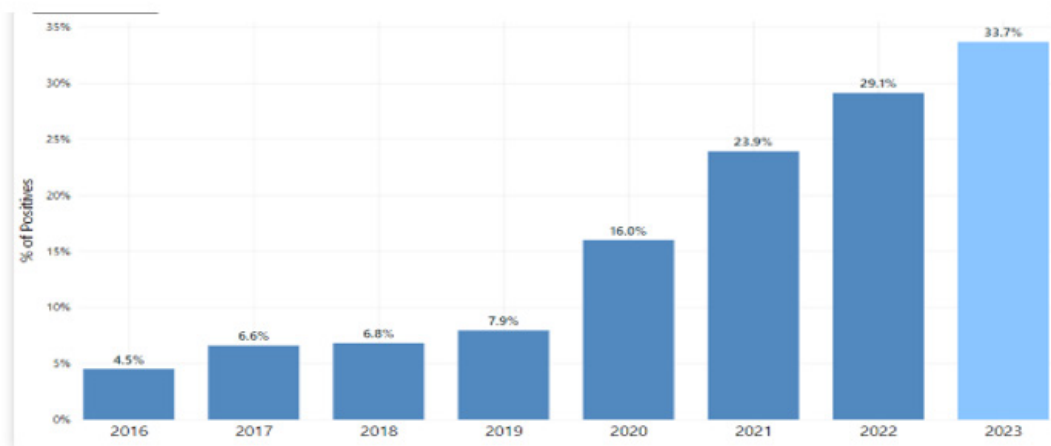


Figure 3: Fentanyl Methamphetamine.

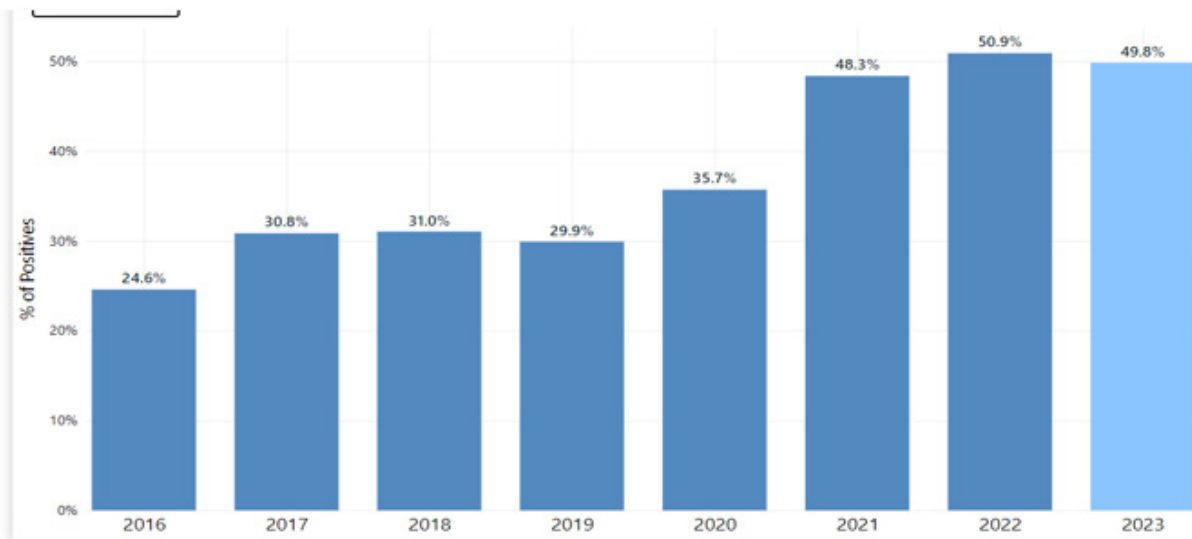


Figure 4: Fentanyl 6 acetyl morphine.

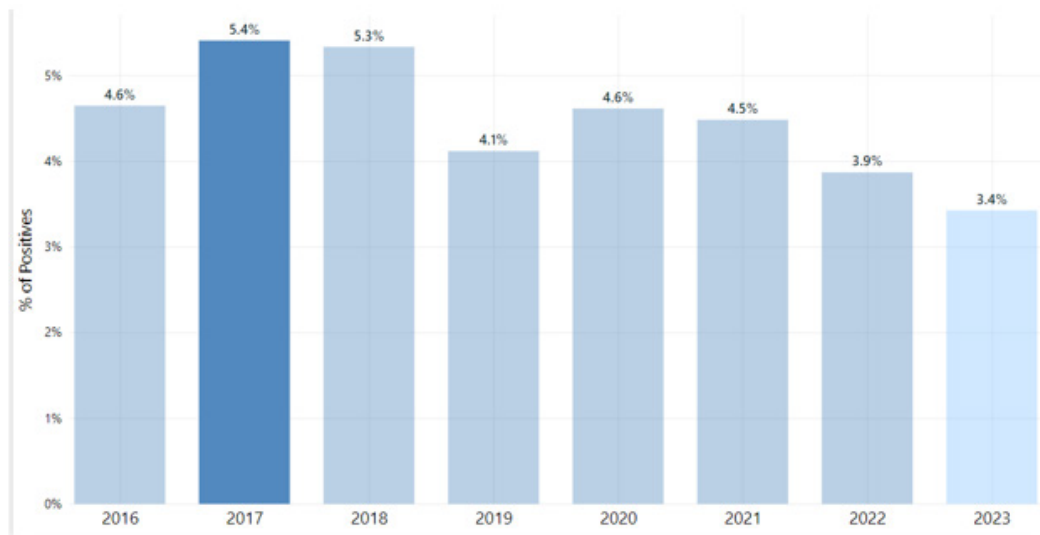


Figure 5: Fentanyl oxycodone.

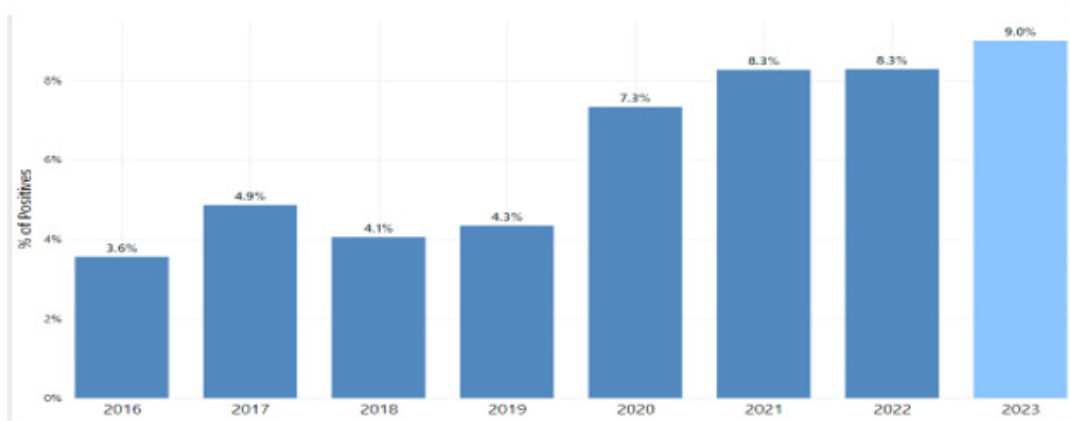


Figure 6: Fentanyl and THCA.

Discussion

Over the past 8 years, we have examined more than 3 million specimens from an at-risk population. This work describes an update of our observations on the incidence of fentanyl in our urine specimens.

Newspaper articles have claimed there is a major increase of its use and increased presence in illicit and “prescription drugs” obtained on the street [13]. We observed a large percent increase in fentanyl in those specimens positive for benzoylcegonine, methamphetamine and THCA. The percentage of heroin positive for fentanyl increased from 2016 but appears to have levelled off in recent years. However, about 50% of the 6 acetyl morphine specimens contained fentanyl. This was the highest percentage of the combination of an illicit drug with fentanyl.

The patients on medication treatment for substance abuse also showed an increase in polysubstance abuse. Those treated with methadone more likely to also be abusing fentanyl.

This study is limited as specimens are derived from our monitored population and may not be applicable to a more general population.

Acknowledgement

All the authors are employees of Precision Diagnostics LLC.

Conflict of Interest

There are no conflicts of interest.

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