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Short communication

## Shifts in drug seizures in the United States during the COVID-19 pandemic

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## ABSTRACT

**Background:** Little is known regarding how the COVID-19 pandemic has affected patterns of drug use in the United States. Because drug seizures can serve as a proxy for drug availability, we examined shifts in drug seizures in the US during the pandemic.

**Methods:** We examined trends in seizures of marijuana, cocaine, methamphetamine, heroin, and fentanyl within five High Intensity Drug Trafficking Areas—Washington/Baltimore, Chicago, Ohio, New Mexico, and North Florida. Trends were examined for number and total weight of seizures from March 2019 through September 2020 using Joinpoint regression.

**Results:** Significant decreases in seizures involving marijuana ( $\beta = -0.03$ ,  $P = 0.005$ ) and methamphetamine ( $\beta = -0.02$ ,  $P = 0.026$ ) were detected through April 2020, and then seizures of marijuana ( $\beta = 0.10$ ,  $P = 0.028$ ) and methamphetamine ( $\beta = 0.11$ ,  $P = 0.010$ ) significantly increased through September 2020. The number of seizures involving marijuana and methamphetamine peaked in August 2020, exceeding the highest pre-COVID-19 number of seizures. Fentanyl seizures increased overall ( $\beta = 0.05$ ,  $P < .001$ ), but did not significantly drop during the start of COVID-19, and significant changes were not detected for cocaine or heroin. We also detected a significant increase in weight of marijuana seized from April through September 2020 ( $\beta = 0.40$ ,  $P = .001$ ). The weight of marijuana seized in August 2020 exceeded the highest pre-COVID-19 weight.

**Conclusion:** The COVID-19 pandemic was associated with an immediate decrease in marijuana and methamphetamine seizures, and then increases throughout 2020 with some months exceeding the number (and weights) of seizures from the previous year. More research is warranted to determine the extent to which these seizures reflect changes in drug use.

## 1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has resulted in widespread implementation of containment measures throughout the United States (US) and the majority of other countries. By mid-March 2020, many US states began enforcing travel restrictions, bans on large gatherings, closings of non-essential businesses, and/or stay-at-home orders in an attempt to curb transmission (Schuchat, 2020). There exists relatively little information about how COVID-19 and associated measures to curb infection have affected human behaviors. The behaviors that have gained attention are those related to access to care and overdose. It is plausible that the increase in personal “leisure”

time due to widespread restrictions may be accompanied by an increase in demand for drugs and perhaps drug use itself. As such, we hypothesized that drug seizures, one potential proxy for drug availability, would also increase during the pandemic in a manner that may reflect increased rates of drug use, which would then warrant additional epidemiological research efforts.

Thus far, research examining drug use and related outcomes in relation to the COVID-19 pandemic has yielded mixed results. According to reports published by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), there was a decline in use of party drugs such as cocaine, ecstasy, and LSD in Europe during the first three months of the pandemic (EMCDDA, 2020a,b). The EMCDDA also reported that

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prevalence of marijuana use decreased among infrequent users and increased among frequent users. Smaller studies in the US also determined decreased prevalence of use of party drugs and higher frequency of marijuana use during early months of the COVID-19 pandemic (Bartel et al., 2020; Palamar et al., 2020; Starks et al., 2020). Along with reported decreases in use of select drugs, international agencies also reported decreased availability of drugs such as heroin, ecstasy, cocaine, and amphetamine during early months of the pandemic, both in Europe and in North America (EMCDDA, 2020a,b; United Nations Office on Drugs and Crime, 2020). Reduced availability was likely due to reduced production, difficulty trafficking shipments during restricted travel, and decreased demand for some drugs.

Despite data suggestive of decreases in drug use and availability during the early months of the pandemic, various studies have determined that overdoses and emergency medical services to transport overdose patients increased during this same period (Glober et al., 2020; Ochalek et al., 2020; Rodda et al., 2020; Slavova et al., 2020). In addition, studies investigating biospecimen testing in clinical laboratories found that there was a higher percentage of positive detection of cocaine, heroin, and fentanyl during the early months of the pandemic compared to before the pandemic (Niles et al., 2020; Wainwright et al., 2020).

Given current conflicting information about changes in drug use, availability, and adverse drug-related outcomes after the onset of the COVID-19 pandemic, we examined trends in drug seizures in the US to provide additional insight to clarify how the pandemic and its associated restrictions have been affecting drug use. Although seizure data is not the most reliable indicator of prevalence of drug use, it can serve as an indicator of drug supply or availability and future use. For example, fewer seizures, or lower volumes of drugs seized, can reflect disruption of drug supply chains (EMCDDA, 2020b). Further, the number of fentanyl seizures is strongly correlated with rates of synthetic opioid-involved deaths (Gladden et al., 2016; JAMA, 2017; Zibbell et al., 2019); one study also found that cocaine seizures were positively associated with cocaine-related emergency department visits (Wan et al., 2016). Therefore, shifts in the number of seizures may not only indicate drug availability, but also indicate shifts in drug-related poisonings or deaths. In this analysis, we examined whether trends in drug seizures in the US shifted during the COVID-19 pandemic.

## 2. Methods

### 2.1. Procedure

Congress created The High Intensity Drug Trafficking Areas (HIDTA) program in 1988 to assist federal, state, local, and tribal law enforcement agencies within areas determined to be critical drug trafficking regions in the US. To date, there are 33 HIDTAs, which oversee counties in 50 states, Puerto Rico, the US Virgin Islands, and the District of Columbia (High Intensity Drug Trafficking Area, 2019). HIDTAs encourage collaboration among law enforcement agencies with a goal to disrupt and dismantle drug trafficking organizations. HIDTAs collect data on drug seizures made by participating agencies. The HIDTA Performance Management Process collects performance data submitted quarterly from all 33 HIDTAs. Five HIDTAs agreed to share drug seizure data with the National Drug Early Warning System (NDEWS) for the purpose of developing standard analytical methods that would eventually be used across the HIDTA program to examine seizure data. As such, we examined trends in seizures of marijuana, cocaine, methamphetamine, heroin, and fentanyl reported by five HIDTAs—Washington/Baltimore, Chicago, Ohio, New Mexico, and North Florida.

### 2.2. Statistical analysis

We examined monthly trends in seizures between March 2019 and

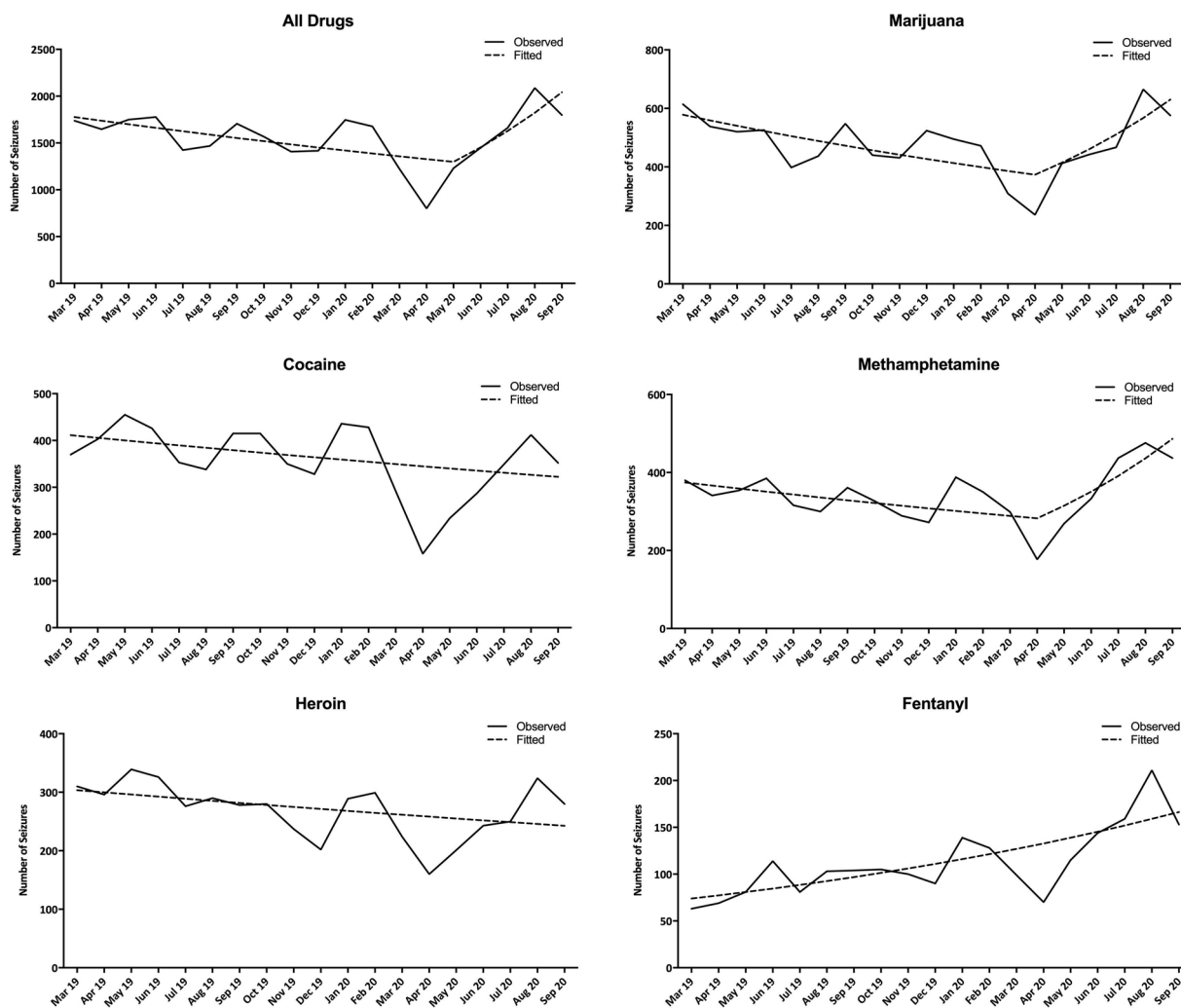
September 2020. March 2019 was chosen as the starting point as this was 12 months before COVID-19 was declared a worldwide pandemic by the World Health Organization. Joinpoint Regression version 4.8.0.1 (National Cancer Institute, 2020) was used to examine trends. Also known as broken line, piecewise, multi-phase, or segmented regression, Joinpoint fits weighted least-square regression models to rates or counts on a log transformed scale (Ingram et al., 2018; Kim et al., 2000). It also uses Monte Carlo permutation tests with a Bonferroni correction for multiple testing and identifies models with the best-fit set of joinpoints. These are points (or 'knots') in trends that indicate significant shifting points. Poisson models were specified under the assumption of non-constant variance or heterogeneity over time. A separate joinpoint analysis was conducted for monthly counts of seizures regarding: 1) all drugs combined (limited to the five drugs in this study); and 2) for each drug separately: marijuana; cocaine; methamphetamine; heroin; and fentanyl. These analyses were then repeated examining trends in total weight of each drug seized per month. This secondary data analysis was exempt from review by the New York University Langone Medical Center institutional review board.

## 3. Results

We obtained data on 34,384 seizures between March 2019 and September 2020, 29,574 of which were identified as any of the five drugs we examined in this study, making up 86.0 % of all seizures. Within the five drugs examined, the plurality of seizures was marijuana (30.6 %,  $n = 9050$ ), followed by cocaine (23.0 %,  $n = 6801$ ), methamphetamine (21.9 %,  $n = 6491$ ), heroin (17.3 %,  $n = 5104$ ), and fentanyl (7.2 %,  $n = 2128$ ). The total weight of marijuana seized was 56,704 kg, followed by cocaine (5152 kg), methamphetamine (2423 kg), heroin (1247 kg), and fentanyl (793 kg).

Trends in monthly seizure counts are presented in Fig. 1. With regard to all drug seizures combined, the number of seizures significantly decreased from March 2019 through April 2020 ( $\beta = -0.02$ ,  $SE = 0.01$ ,  $P = 0.046$ ). While the increase after April 2020 only approached significance ( $\beta = 0.11$ ,  $SE = 0.07$ ,  $P = 0.103$ ), the number of overall seizures in August of 2020 ( $n = 2088$ ) exceeded the highest pre-COVID-19 count in our analysis (1777 in June 2019). With respect to marijuana, the number of seizures significantly decreased from March 2019 through April 2020 ( $\beta = -0.03$ ,  $SE = 0.01$ ,  $P = 0.005$ ), and then significantly increased through September 2020 ( $\beta = 0.10$ ,  $SE = 0.04$ ,  $P = 0.028$ ). The number seized in August 2020 ( $n = 665$ ) exceeded the highest pre-COVID-19 count in our analysis (614 in March 2019). Multiple slopes were not detected for cocaine seizures and the overall single slope was not significant. With regard to methamphetamine, the number of seizures steadily decreased from March 2019 through April 2020 ( $\beta = -0.02$ ,  $SE = 0.01$ ,  $P = 0.026$ ), and then significantly increased through September 2020 ( $\beta = 0.11$ ,  $SE = 0.04$ ,  $P = 0.010$ ). The number seized in August 2020 ( $n = 476$ ) exceeded the highest pre-COVID-19 count in our analysis (385 in June 2019). No significant slopes were detected regarding heroin seizures, but the number of fentanyl seizures significantly increased across time ( $\beta = 0.05$ ,  $SE = 0.01$ ,  $P < .001$ ). The increase in fentanyl seizures did not significantly shift during the pandemic. Supplemental Fig. 1 presents trends stratified by area.

Trends in total weight of seizures are presented in Fig. 2. With respect to the total weight of all five drugs combined, the weight remained stable from March 2019 through April 2020 and then significantly increased through September 2020 ( $\beta = 0.32$ ,  $SE = 0.10$ ,  $P = .007$ ). The weight in August 2020 (11,698 kg) exceeded the highest pre-COVID-19 monthly weight in our analysis (5040 kg in December 2019). With respect to marijuana, three non-significant pre-COVID-19 slopes were identified, and we detected a steep significant increase from April 2020 through September 2020 ( $\beta = 0.40$ ,  $SE = 0.08$ ,  $P = .001$ ). The total weight in August 2020 (11,194 kg) greatly exceeded the highest pre-COVID-19 weight for marijuana seizures in our analysis (4744 kg in December 2019). Increases in weight were not detected for the total



**Fig. 1.** Trends in drug seizure counts from March 2019 through September 2020. Raw (observed) counts and fitted trend estimates are presented for seizures involving 1) any of the five drugs, 2) marijuana, 3) cocaine, 4) methamphetamine, 5) heroin, and 6) fentanyl. Y axes are presented on different scales across drugs depending on the number of seizures.

weight of seizures involving methamphetamine or fentanyl, and the overall single slopes were not significant. There was a pre-COVID-19 increase in weight of cocaine seizures which peaked in June 2019 ( $\beta = 0.98$ ,  $SE = 0.38$ ,  $P = .027$ ) and thereafter decreased in a non-significant manner. The total weight of heroin seizures significantly decreased across time ( $\beta = -0.08$ ,  $SE = 0.02$ ,  $P = .003$ ), but multiple slopes were not detected. Supplemental Fig. 2 presents trends stratified by area.

**4. Discussion**

To our knowledge, this is the first study to examine potential shifts in drug seizures during the COVID-19 pandemic. We detected a significant decrease in overall drug seizures near the beginning of the pandemic with a nadir in April 2020, and then an increase through September. These shifts were driven by marijuana and methamphetamine seizures. In addition, the volume of seizures also significantly increased after April 2020, and this increase was clearly driven by an increase in volume of marijuana seizures. Peaks in number and volume of seizures for marijuana in particular surpassed pre-COVID-19 peaks.

Most published studies that have examined drug trends in relation to COVID-19 focused on the early months of the pandemic, but this study examined trends through roughly six months after the start. We did not detect significant dips in seizures involving cocaine or heroin during the

pandemic, so our findings do not appear to corroborate those from other studies suggesting decreased use or availability. However, other studies did report a higher number of people using fentanyl after the onset of COVID-19 (Niles et al., 2020; Wainwright et al., 2020), possibly as a replacement for heroin, which reportedly decreased in availability. Indeed, we detected an upward shift in seizures of fentanyl beginning even before the pandemic. Although some other studies found that the frequency of marijuana use increased shortly into the pandemic among certain populations (Bartel et al., 2020; EMCDDA, 2020a,b; Palamar et al., 2020; Starks et al., 2020), we detected an initial decrease in seizures followed by a steep increase in later months. It is unknown if increased frequency of prevalence of marijuana use was associated with lagged increases in seizures.

Ultimately, the overall increase in drug seizures as the COVID-19 pandemic progressed warrants additional research investigating how prevalence of drug use has changed during this period, as well as to determine potential changes in drug availability, poisonings, and deaths. While decreases in seizures, for example, likely indicate decreases in drug availability, it is also possible that decreases may indicate reduced law enforcement during the early months of the pandemic. Further, it is unknown whether the high post-COVID-19 peaks indeed represent greater availability of marijuana and methamphetamine or whether law enforcement officials were merely ‘catching up’ regarding previous months of delayed seizures.

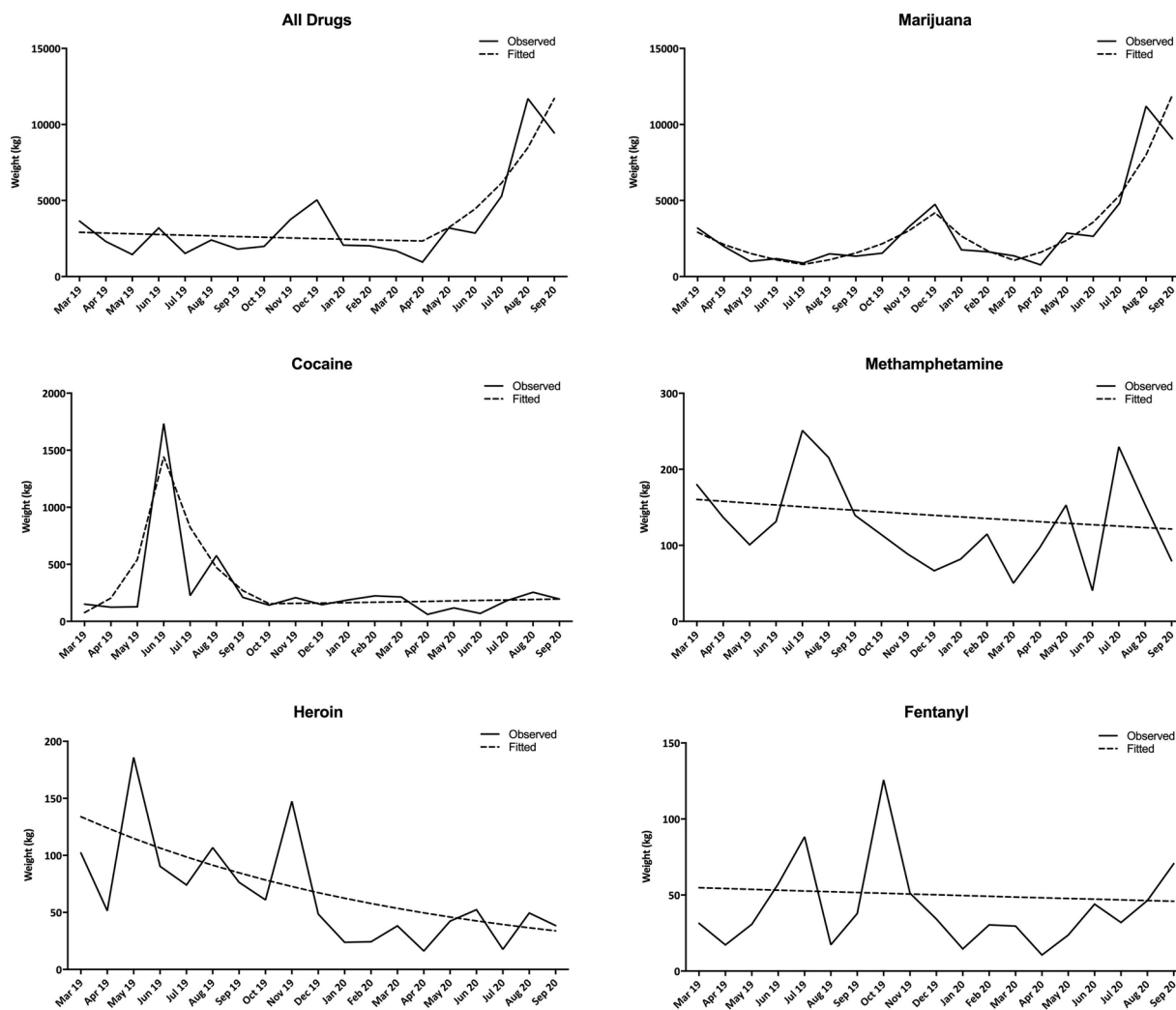


Fig. 2. Trends in drug seizure volume from March 2019 through September 2020. Raw (observed) counts and fitted trend estimates are presented for seizures involving 1) any of the five drugs, 2) marijuana, 3) cocaine, 4) methamphetamine, 5) heroin, and 6) fentanyl. Y axes are presented on different scales across drugs depending on the number of seizures.

4.1. Limitations

We were only able to obtain data from five HIDTAs, so it is possible that seizures from these areas in the US do not fully reflect seizures in other areas. Analyses were limited to data from one year prior to the start of the COVID-19 pandemic; therefore, trends detected during COVID-19 are relative only to this period before the start of the pandemic. Drug samples testing positive for any fentanyl were coded as fentanyl seizures in the HIDTA database, which could lead to over-estimates in total volume. Carfentanyl seizures were also coded as fentanyl seizures in this analysis although these only consisted of 2.4 % of fentanyl-related seizures. When examining trends in weight of total seizures, we only included drugs seized that were measured in kg. For example, 2.7 % of marijuana seizures were recorded in “dosage units” (which most commonly refers to pills) or in liters. We could not convert dosage units or liters to kg with confidence, so we omitted these seizures when examining volume. Finally, we did not have access to arrest data or data on the number of police officers (or number of hours worked), so we could not determine whether decreases in seizures were a function of restricted police activity during the pandemic due to health concerns.

4.2. Conclusion

We detected significant decreases in marijuana and

methamphetamine seizures right at the beginning of the COVID-19 pandemic and then detected increases in the following months exceeding pre-COVID-19 seizure rates. We did not, however, detect significant shifts during COVID-19 with regard to seizures involving cocaine, heroin, or fentanyl, although the number of fentanyl seizures increased in a stable manner, independent of COVID-19. While more research is needed, these data indicate that while availability of various drugs decreased during the beginning of the pandemic, seizures of marijuana and methamphetamine in particular then surpassed pre-COVID-19 levels roughly six months into the pandemic. Future studies should consider harmonizing seizure data along with data from surveys, poisonings, and deaths, in order to determine the most accurate picture of drug use trends during the pandemic.

Contributors

All authors are responsible for this reported research. J. Palamar conceptualized and designed the study, and J. Palamar conducted the statistical analyses. T. Carr provided access to the data. A. Le assisted with graphical representation of the findings. All authors drafted the manuscript, and all authors interpreted results, and critically reviewed and revised the manuscript. All authors approved the final manuscript as submitted.



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## Declaration of Competing Interest

The authors report no declarations of interest.

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## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.drugalcdep.2021.10.8580>.

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