The Epidemic Within the Pandemic: Drivers of Overdose Deaths During Covid-19.

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Overview

After months of deaths and economic misery due to COVID-19, media across the United States have reported a dramatic surge in opioid overdoses and deaths. Understanding the drivers of this increase in opioid overdose deaths is key to addressing this epidemic within the pandemic. To this end we have assembled data from 2018 through August 2020 from medical examiners offices in counties currently covering 10 percent of the population of the U.S.[1] We hope to increase this coverage to 20 percent of the U.S. population in the next month. Medical examiners have jurisdiction over overdoses as well as other categories of deaths including suicides. These data provide timely week-by-week information about detailed causes of death.

We are investigating several hypotheses about the causes of the observed spikes in overdoses:

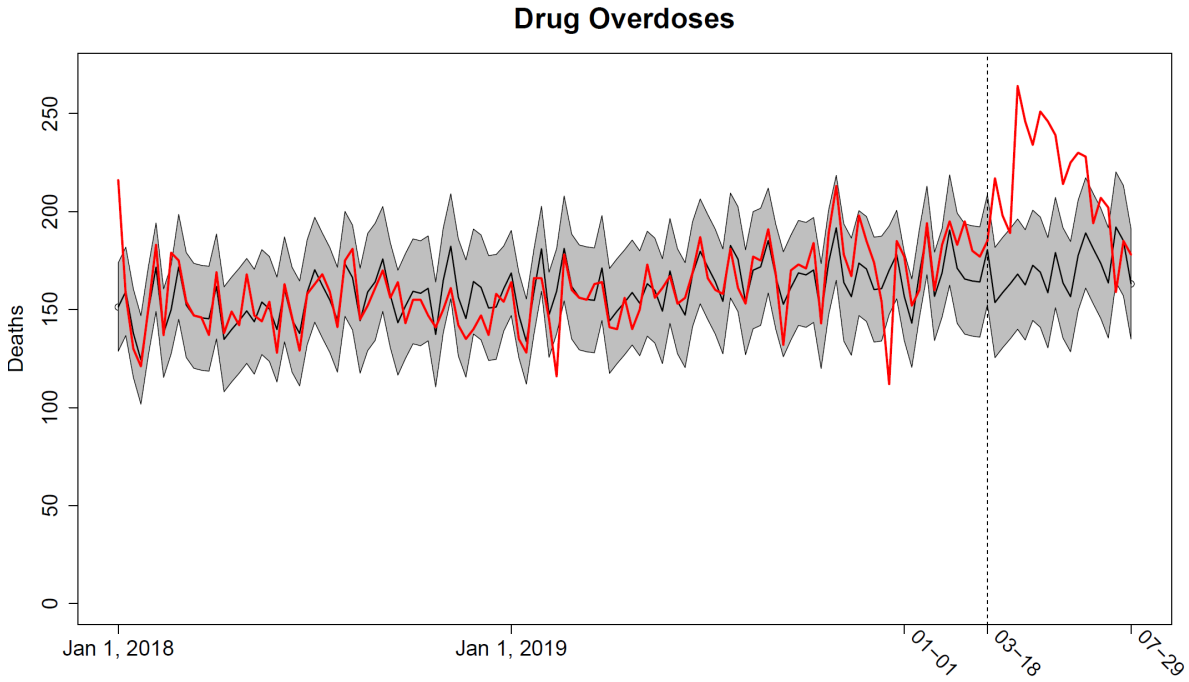
1) They may coincide with lockdowns.
2) They may instead be related to fear of the pandemic, which we can capture using mobility data.
3) They may be related to economic pain caused by employment losses. It is difficult to get fine-grained employment data in a timely way, but we could use the Local Area Unemployment Statistics to try to capture this.
4) It may be related to reduced access to treatment which we can measure using prescription data from IQVIA. In the attached paper we show that new entrants into Medication Assisted Treatment (MAT) fell when the pandemic hit and have stayed below expected levels projected using data from prior years. In contrast, prescription opioids to new users fell, but quickly rebounded to previous levels. Existing users of MAT and prescription opioids were not greatly affected.

Simple descriptive analysis that we are conducting suggest an interesting story. For example, Figure 1 below shows the actual vs. predicted pattern of overdoses in all of the counties we currently have. The prediction is based on the data from 2018 through Feb. 2020, and we also show a 95 percent confidence interval. The figure shows a spike in overdose deaths in April 2020, but these deaths rapidly decline to baseline levels by July. Figure 2 shows more detailed figures for the state of Ohio, where we have data from every county's medical examiners. These figures show that overdose deaths spiked right after the Ohio lockdown, but then declined. After July that numbers trail off, but this is likely due to incomplete data. These excess overdoses were almost all fentanyl-related. There was no increase in overdose deaths due to prescription opioids and also no change in suicides. It is also possible to split data by age, sex, race, and location of death.

At a minimum, we can promise a lot of interesting descriptive data by the time of the conference, and we hope to have results looking at the four potential causes outlined above as well.

[1] Data is available for more recent weeks but becomes less complete as one nears the present since it takes time to complete autopsies and toxicology reports. We currently include data from select counties in Ohio, Illinois, California, Florida, and Texas, and will add New York City.

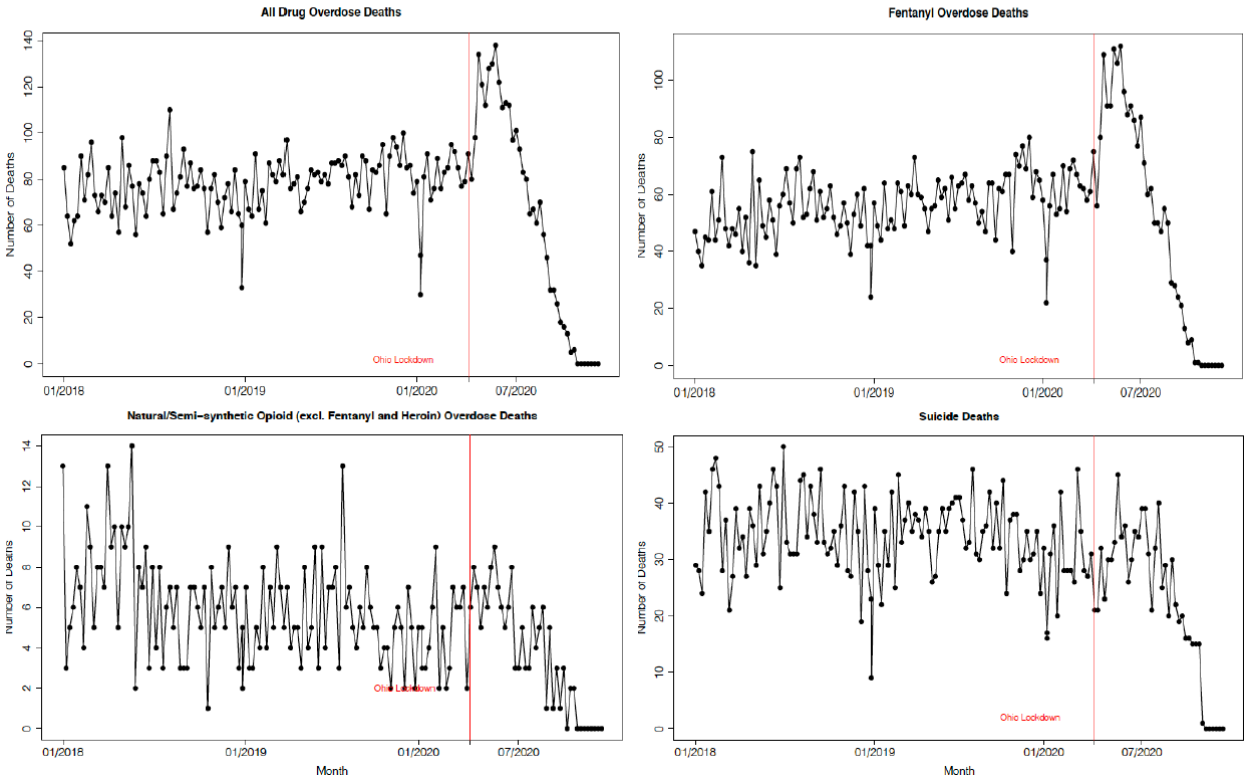
Figure 1



Notes: This figure shows weekly data on drug overdose deaths from county medical examiner offices from the following counties: Cook county, IL; Harris, Dallas, Tarrant, Denton, Parker, Johnson, and Travis counties, TX, San Diego county, CA; Orange county, FL; and all counties in the state of Ohio. These counties account for 10% of the US population and 12% of drug overdose deaths in 2019. Predicted overdoses are shown in black and a 95% confidence band is shown in grey. The predicted values are estimated from a linear regression of total weekly overdose deaths on a linear time-trend, calendar week fixed effects, and an indicator for whether a holiday occurred on that week. During weeks with excess deaths in 2020, observed overdoses exceed expected overdoses by 36.8%.

Figure 2

Overdose and Suicide Deaths in Ohio, 2018-2020



Notes: This figure shows weekly data on deaths from county medical examiner's offices in Ohio. Data through July is relatively complete. Deaths may appear to decline after that due to pending cases.

Use of Opioid Analgesics and Medication-Assisted Treatment for Opioid-Use Disorder During the Pandemic:

Actual vs. Expected Numbers of Patients and Prescriptions

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Key Points (100 words)

Question: Has the coronavirus 2019 pandemic affected prescribing of opioid analgesics and medication-assisted treatment?

Findings: We analyze prescriptions from 67,400,981 patients. From March 18-May 19, 2020, total morphine milligram equivalents of opioid analgesics prescribed to existing users was constant while prescriptions to opioid-naïve patients were 78% of expected levels. Similarly, prescribing of medication-assisted treatment to existing patients was constant but new patients were 83% of expected. After May 20, opioid prescribing recovered while initiation of medication-assisted treatment remained depressed through August.

Meaning: Prescriptions for opioid analgesics and medication-assisted treatment declined among new, but not existing, patients during the COVID-19 pandemic.

Abstract (350 words)

Importance: The coronavirus 2019 pandemic disrupted access to medical care, impacting prescribing of opioid analgesics for pain management and medication-assisted treatment for opioid use disorders. Understanding these patterns can help address barriers to care.

Objective: To determine how prescribing of opioid analgesics and medication-assisted treatment was affected by the pandemic. We hypothesize that potential new users of both classes of medications were more affected.

Design, Setting, and Participants: Expected drug use from March 18-September 1, 2020 was forecast using a national database of retail prescriptions from September 1, 2018 through March 3, 2020. Actual prescribing since March 18, 2020 was then compared to expected levels for all, existing, and new patients. The data include prescriptions to patients independent of insurance status or type and cover 90% of retail, 70% of mail order, and 70% of nursing home prescriptions.

Main Outcomes and Measures: Prescriptions for opioid analgesics (e.g., hydrocodone and oxycodone) and medication-assisted treatment (buprenorphine and naltrexone) were considered. Outcomes included total number of prescriptions, total morphine milligram equivalents, average quantity (units) per prescription, and number of patients filling prescriptions.

Results: We analyzed 262,704,477 prescriptions for opioid analgesics and medication-assisted treatment for 67,400,981 patients. From March 18-May 19, 2020, total morphine milligram equivalents of opioid analgesics prescribed to existing users met expected levels [102%, 95% CI 96 to 108%, P=0.58]. However, the number of opioid-naïve patients receiving opioids was 68% of expected [68%, 95% CI 66 to 70%; P<.001]. Likewise, prescribing of medication-assisted treatment was constant for existing patients while the number of new patients fell to 83% of expected [83%, 95% CI 80 to 86%; P<.001]. From May 20-September 1, 2020, opioid prescribing for new patients recovered to expected levels while the number of new patients receiving medication-assisted treatment was 89% of expected [89%, 95% CI 85 to 92%; P<.001].

Conclusions and Relevance: Existing users of opioid analgesics and medication-assisted treatment generally maintained access to these drugs during the COVID-19 pandemic. Opioid prescriptions to opioid-naïve patients fell briefly while initiation of medication-assisted treatment remained depressed through August. Continuing reductions treatment entry may be contributing to overdose deaths.

Many medical services have been disrupted due to the coronavirus disease 2019 (COVID-19) pandemic.[1] At the same time, there have been reports of increases in deaths due to opioid overdoses.[2] In this journal, Danielle Haley and Richard Saitz linked disruption in services to increases in overdoses, writing that "It is likely that the emergence of [COVID-19] and subsequent disruptions in health care …will fuel the opioid epidemic."[3] Disruptions to medical care may have affected existing patients and new patients differently. Existing users of prescription opioids may have suffered supply reductions, with possibly negative effects on pain control and substitution to non-prescription opioids. Opioid-naïve patients may have been less likely to be prescribed opioids at all. Reduced access to treatment for opioid use disorder, even among patients with life-threatening episodes, has also been documented in some cases.[4] However, emergency Medicaid expansions and greater use of telehealth may also have improved access to treatment for some.[5] Hence, it is unclear how the pandemic has impacted access to opioid analgesics and medication-assisted treatment overall.

We use the largest available national longitudinal database of prescriptions and ask how prescribing of opioid analgesics for pain management and medication-assisted treatment (MAT) for opioid-use disorder evolved between January 1, 2018 and September 1, 2020. The data allow us to distinguish between new and existing patients. We hypothesize that potential new patients were the most affected by changes in prescribing due to the COVID-19 pandemic.

Methods

Prescription and Patient Data

Prescription data are from IQVIA's longitudinal prescription (LRx) database. The database includes two billion prescriptions per year representing over 90% of prescriptions led at retail pharmacies, 70% of mail order drugs, and 70% of drugs used in long-term care. These data represent drugs actually obtained by patients and come from electronic records from pharmacies, payers, software providers, and transactional clearinghouses. We analyze 262,704,477 opioid analgesic (i.e., hydrocodone, oxycodone, etc.) and MAT prescriptions (buprenorphine and naltrexone) for 67,400,981 unique patients.

All personal health information (PHI) were removed or encrypted by a proprietary, automated de-identification engine prior to being collected by IQVIA. Patients are followed only via an anonymous patient token. This process has been certified as Health Insurance Portability and Accountability Act compliant and institutional review board-exempt by Princeton University's institutional review board.

Prescription Measures

Data are aggregated to the weekly level (e.g., January 1-January 7, 2018). We construct four weekly measures for opioid analgesics: (1) total number of prescriptions filled, (2) total milligrams of morphine equivalents (MMEs), (3) average MMEs per prescription, and (4) average quantity per prescription. We construct three analogous weekly measures for MAT medications: (1) total number of prescriptions filled, (2) total units prescribed, and (3) average number of units (e.g. pills) per prescription.

Although methadone is used for MAT of opioid use disorders, methadone is often offered in clinical settings and may not show up as prescriptions from retail pharmacies. Methadone can also be used for pain management, so the prescriptions we do observe could be for either indication. We therefore exclude the 2,710,420 prescriptions for methadone in our data; these prescriptions account for 9.3% of all of buprenorphine, naltrexone, and methadone prescriptions over our sample period.

Patient Measures

The number of distinct patients filling prescriptions for opioid analgesics and the number using MAT are calculated for each week. A patient is classified as opioid-naïve if they have not filled an opioid analgesic prescription in the past 365 days. Similarly, MAT users are classified as new users if they have not filled a prescription for buprenorphine and/or naltrexone within the previous 365 days. As discussed above, methadone users are dropped. All other patients are classified as existing users. Patient-level measures are constructed beginning in 2019 to allow for a 365-day lookback period.

Statistical Analysis

In addition to presenting plots of the variables discussed above, we ask how drug use deviated from expected patterns based on prior prescriptions. Prescription patterns show seasonality as well as trends over time. In particular, there is a declining trend in prescriptions for opioid analgesics over time and a rising trend in MAT use. Prescriptions also typically fall in weeks that include major holidays.

To account for these patterns, we estimated linear regressions of our outcomes over the pre-pandemic period (from September 1, 2018 to March 3, 2020) on separate indicators denoting each week of the year, a linear time trend in weeks from the start of our sample, and an indicator equal to one if a major holiday occurred during the week in question and zero otherwise. Predicted weekly counts of the prescription and patient measures were then used to construct expected prescription and patient numbers during the COVID-19 pandemic. We focus on the ratio of actual to expected outcomes, which represents the estimated percentage deviation from expected for each measure. We compute corresponding confidence intervals and p-values indicating whether the actual outcomes were significantly different than expected.

Predicted values are calculated for two distinct periods intended to capture the initial impact of COVID-19 and the subsequent return to more normal activity levels. Specifically, the first period includes the weeks of March 18, 2020 to May 19, 2020. The starting date followed the President's declaration of a National Emergency Concerning the Novel Coronavirus Disease Outbreak.[6] The week of May 19 was the first week that the 7-day moving average of deaths had dropped below 1,500 per day since early April 2020.[7] The second period begins on May 20 and continues through September 1, 2020. All data analyses were conducted using R version 4.0.2.

Results

Graphical Analysis

Weekly prescription measures for opioid analgesics in 2018, 2019, and 2020 are shown in Figure 1. There is a declining trend in the number of prescriptions, total MMEs, average MMEs per prescription, and average quantity per prescription over time (e.g., number of pills). The numbers for 2019 are lower than in 2018, and 2020 was on track for prescriptions to be lower still. A declining trend within the years of 2018 and 2019 is also visible, as is the effect of holidays. Focusing on the initial stages of the pandemic from March 18 to May 19, 2020, there is a precipitous decline in weekly opioid prescriptions from a maximum of 1,577,252 in the first week to a minimum of 1,341,635 in the week of April 15, 2020. Panel B shows that despite the drop in the number of prescriptions, total MMEs prescribed was flat. Panels C and D show that this is because average MMEs and total units per prescription increased. All of these changes were short-lived, with levels rebounding to prior 2020 levels after May 20through September 1, 2020.

Weekly prescription measures for MAT prescriptions are shown in Figure 2. Panel A indicates that there was a small decline in the number of prescriptions between March 18 and May 20, 2020. However, Panel B shows that the total units prescribed showed little change either at the peak of the pandemic or afterwards. Panel C demonstrates that this stability in overall quantity is due to an increase in average units per prescription.

Overall patterns in prescribing are dominated by the stock of existing users because they outnumber the flow of new patients in each period. Figure 3 distinguishes between patients who filled an opioid analgesic prescription in the year prior to the index week and those who did not. Because we use a 365-day lookback period to identify new and existing users, only the comparison with 2019 is shown. Figure 3 shows that the number of existing opioid users who filled an opioid prescription declined slightly from March 18 to May 19, 2020, though Panel C shows that there was no change in total MMEs prescribed to these patients. In contrast, Panel B shows that there was a sharp drop in the number of opioid-naïve patients filling opioid prescriptions at the peak of the pandemic, followed by a complete rebound to prior levels after May 2020. Panel D shows that total MMEs prescribed to opioid-naïve patients followed the same pattern.

Figure 4 shows prescriptions for MAT medications for existing and new users. Panel A shows that there was little change in the number of patients filling prescriptions among existing users, and Panel C indicates that there were no changes in total units of MAT to these patients. Panel B indicates that in the early months of 2020, patients entered MAT at higher levels than in early 2019. But entry into MAT fell precipitously between March 18 and May 19, 2020, ending sharply lower than in May 2019. Entry into treatment remained below 2019 levels through September 1, 2020, indicating a longer-term negative effect of the pandemic on entry into treatment.

Actual vs. Expected Outcomes

Table 1 shows actual 2020 measures for the two periods March 18-May 19, 2020 and May 20-September 1, 2020. It shows the ratio of actual to expected levels, a corresponding confidence interval, and a p-value indicating whether the actual is significantly different from the expected. The expected measures are based on the modeling described above. The prediction models used to calculate expected outcomes (available on request) have R-squareds ranging from 0.87 for counts of total opioid analgesic prescriptions to 0.96 for numbers of new MAT patients.

Panel A shows estimates for opioid analgesic prescriptions. The number of prescriptions fell to 90% of expected in the first period [90%, 95% CI 86 to 94%; P<.001] but recovered in the second period [103%, 95% CI 99-108%; P=0.22]. In contrast, total MMEs showed no deviation from expected in the first period [102%, 95% CI 97 to 107%; P=0.24] and a slight but statistically significant increase in the second period [107%, 95% CI 102 to 113%; P=0.02]. As Figure 1 suggests, the decline in total prescriptions in the first period was offset by a statistically significant increase in average MMEs and total units per prescription. This increase in the average size of prescriptions continued into the second period, although the increase over expected was smaller than in the first period.

Panel B shows patterns for MAT medications. The number of prescriptions fell to 95% of expected in the first period [95%, 95% CI 92 to 98%; P<.001] and remained at 94% of expected levels in the second period [94%, 95% CI 91 to 97%; P<.001]. As with prescriptions for opioid analgesics, the overall quantity prescribed was not significantly affected because of a significant increase in the average number of units per prescription in both the first [108%, 95% CI 107 to 109%; P<.001] and second [105%, 95% CI 104 to 106%; P<.001] periods.

Distinguishing between prior users and opioid-naïve patients, Panel C shows that there was a marginally significant decline in the number of existing users filling opioid analgesic prescriptions in the first period [96%, 95% CI 92 to 100%; P=0.05]. However, there was no change in total MMEs prescribed to these patients in either the first [102%, 95% CI 96 to 108%, P=0.58] or second [104%, 95% CI 98 to 110%, P=0.23] periods. Among opioid-naïve patients, the number filling opioid analgesic prescriptions each week fell to 68% of expected [68%, 95% CI 66 to 70%; P<.001] during the first period but recovered to expected levels after May 20 [100%, 95% CI 98 to 103%; P=0.75].

Panel D distinguishes between new and existing users of MAT. Among existing users, there were slight declines in the number filling prescriptions each week in both the first [97%, 95% CI 95-99%; P<.001] and second [96%, 95% CI 94 to 99%; P<.001] periods. However, there was no change in the total units of MAT medications prescribed to these patients in either period [first period: 103%, 95% CI 99 to 108%, P=0.12; second period: 100%, 95% CI 97 to 104%, P=0.88]. In contrast, there were large declines in the number of new patients relative to the number who were expected to enter treatment in both the first [83%, 95% CI 80 to 86%; P<.001] and second [89%, 95% CI 85 to 92%; P<.001] periods.

Discussion

Our estimates suggest that existing users of opioid analgesics suffered little disruption in their supply of such medications during the COVID-19 pandemic. Although they received fewer prescriptions at the peak of the pandemic, each prescription was for a larger quantity. There was therefore little change in total MMEs supplied.

In contrast, opioid-naïve patients were much less likely to be prescribed opioids from mid-March through May 2020, although prescribing quickly recovered to expected levels after that date. Our estimates imply that from March 18 to May 19, 2020, 1.18 million fewer opioid-naïve patients received opioid prescriptions than expected [(1-0.676)*406,808 patients*9 weeks]. To the extent that such prescribing was permanently deferred or replaced with other non-narcotic analgesic medications, this pause in opioid prescribing may have an impact on future opioid use in the affected cohort.[8]

Turning to MAT for opioid use disorder, we find that existing patients were largely able to maintain access to their medications throughout the COVID-19 pandemic. Although slightly fewer existing patients filled prescriptions each week, the prescriptions that were filled were larger on average.

Our results show that the largest and most persistent impacts of the pandemic were borne by potential new MAT patients, the number of which declined sharply relative to expected levels and remained depressed through September 2020. Our estimates suggest that 57,561 patients with opioid use disorder would have received treatment in the absence of the pandemic [{(1-0.831)*18,153 patients*9 weeks}+{(1-0.887)*17,638 patients*15 weeks}]. It is possible that this reduction in treatment availability directly contributed to the spike in overdose deaths during the COVID-19 pandemic.

Increased reliance on telemedicine facilitated by changes in federal regulations[9] may have facilitated access for existing patients. In particular, Health Insurance Portability and Accountability Act penalties were waived for good faith use of telehealth, and the number of days of take-home medications allowed was liberalized. The Drug Enforcement Administration also waived the Ryan-Haight Act, which allowed tele-prescribing of controlled substances without an initial in-person visit. However, this does not seem to have been enough to allow new patients seeking MAT to access care. It may be easier to engage existing patients via telemedicine during a pandemic than to serve new ones.[10]

Strengths and Limitations

The strengths of the analysis stem from the comprehensive nature of the data and its timeliness, which allows for transparent analysis. A limitation of our analysis is that we are unable to see drugs used for opioid use disorder that do not flow through retail pharmacies. We are also unable to determine whether some drugs are being prescribed for pain rather than for opioid use disorder. These considerations led us to exclude prescriptions for methadone from our analysis, but it is also possible that some buprenorphine prescriptions reflect off-label use for pain management rather than opioid use disorder. A second limitation is that the numbers reflect

drugs purchased, and it is possible that not all of the purchased drugs are consumed. Finally, we cannot examine trends in the treatment of opioid use disorder without medication (e.g. therapy), nor can we directly examine the link between MAT and overdose prevention.

Conclusions

Our results suggest that existing users of opioid analgesics suffered little disruption in their medications during the COVID-19 pandemic. Even in the initial stages of the pandemic, providers adjusted the size of prescriptions to compensate for reductions in the number of prescriptions filled. On the other hand, we estimate that 1.18 million fewer opioid-naïve patients received opioid prescriptions in the weeks from March 18-September 1, 2020. Given declining trends in opioid prescribing before the pandemic, it is likely that some of these patients will never receive opioids, thereby reducing future use.

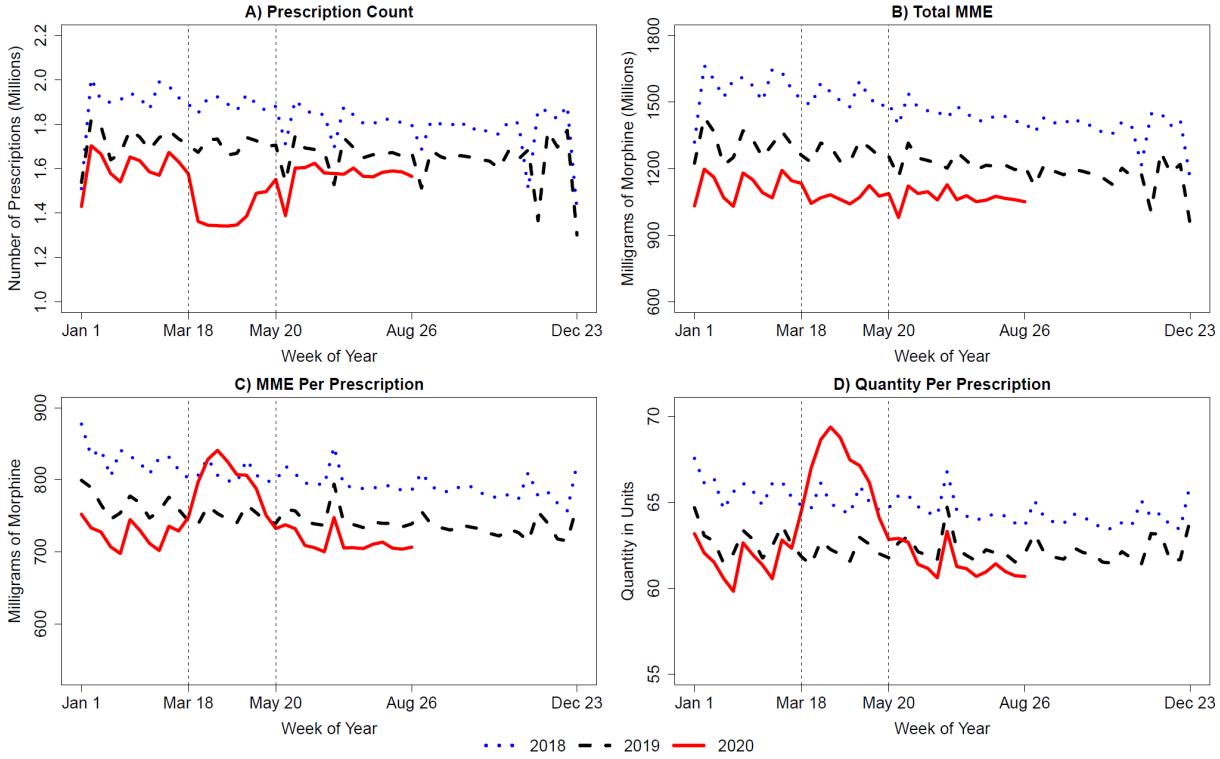
Turning to MAT for opioid use disorders, existing patients likewise maintained access to their medications. However, the number of new patients receiving MAT fell by almost a fifth at the beginning of the pandemic and was still only 89% of expected levels as of the week ending September 1, 2020. We estimate that 57,561 fewer patients entered treatment, which may have contributed to increases in overdose deaths during the pandemic.

Overall, these results suggest that the pandemic reversed some of the improvements in access to MAT for opioid use disorder that occurred over the past decade.[11] Improving and maintaining access to such treatment should be a priority.

Acknowledgements

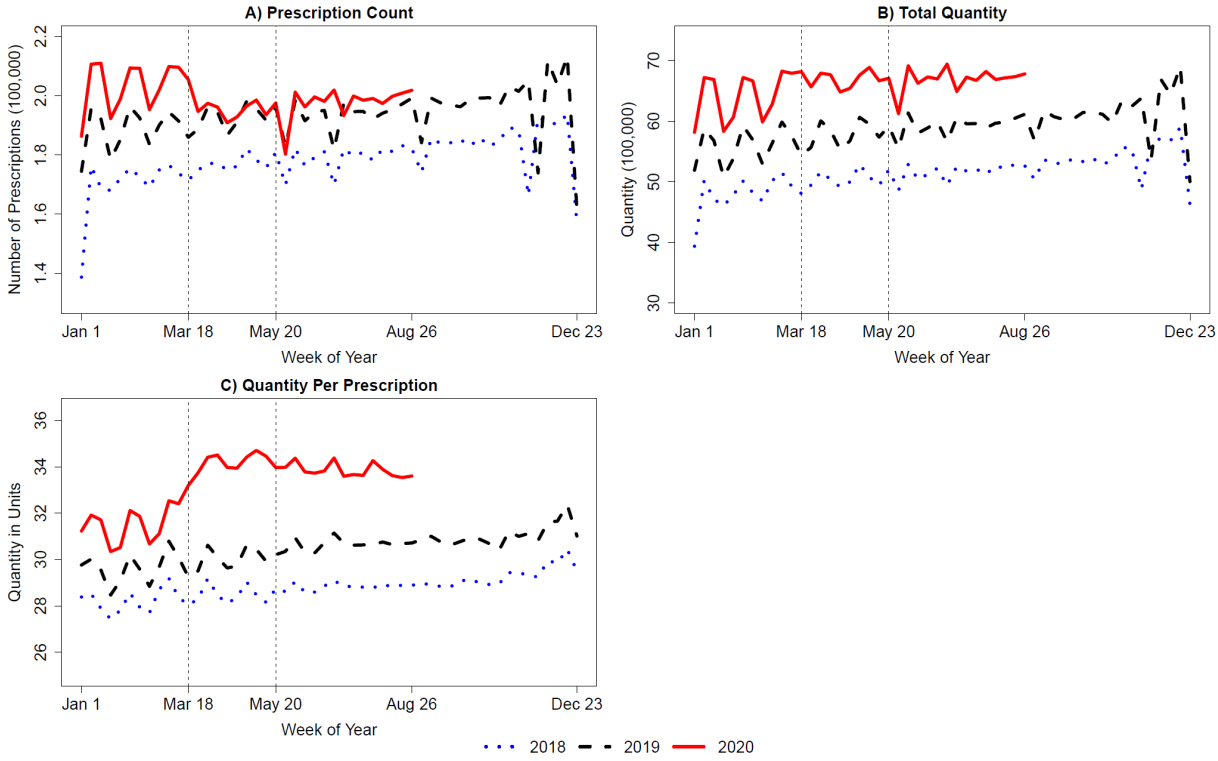
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Figure 1. Weekly prescription measures for opioid analgesics



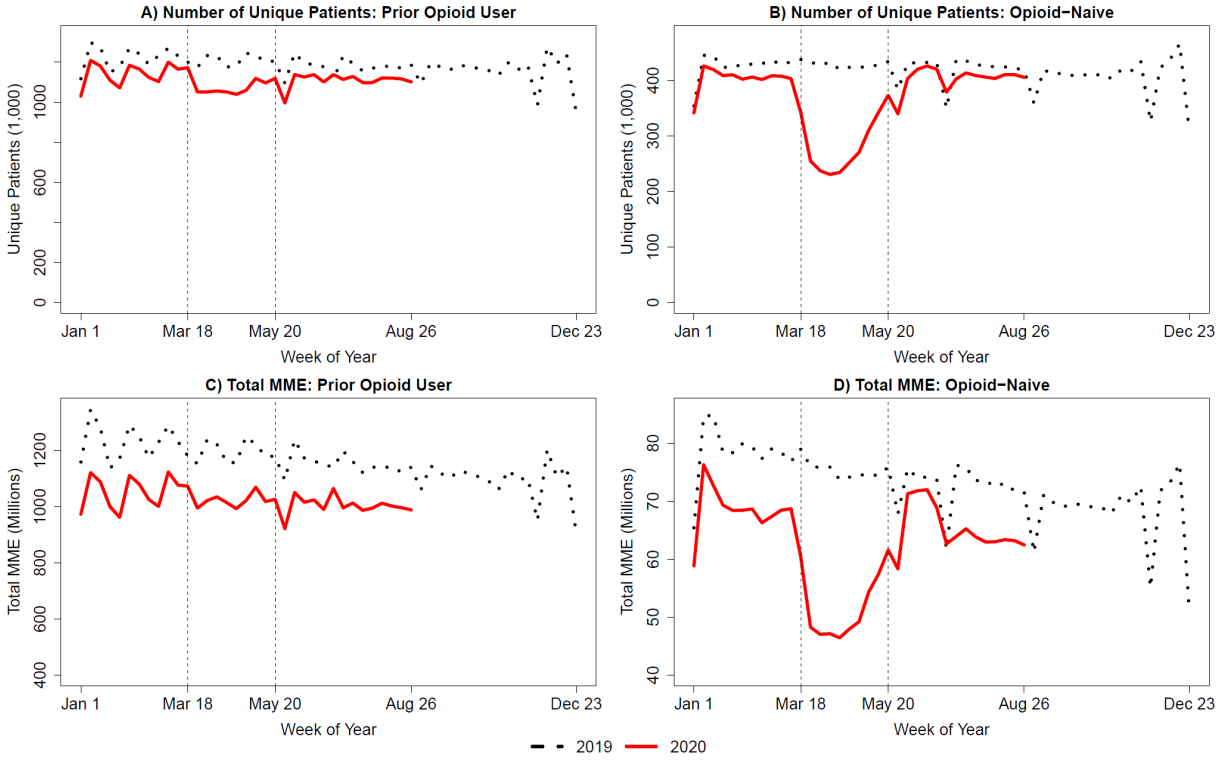
This figure plots total weekly prescription counts, total milligrams of morphine equivalents (MME), MME per prescription, and quantity per prescription for opioid analgesics filled in 2018, 2019, and January 1 to September 1, 2020. Each data point represents the measure over a 7-day week period. Labels on the x-axis refer to the first day of the week. Dotted vertical lines correspond to the week starting on March 18 and May 20, to coincide with the President's declaration of a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak, and the first week that the 7-day moving average of deaths had dropped below 1500 per day since early April 2020, respectively.

Figure 2. Weekly prescription measures for MAT medications



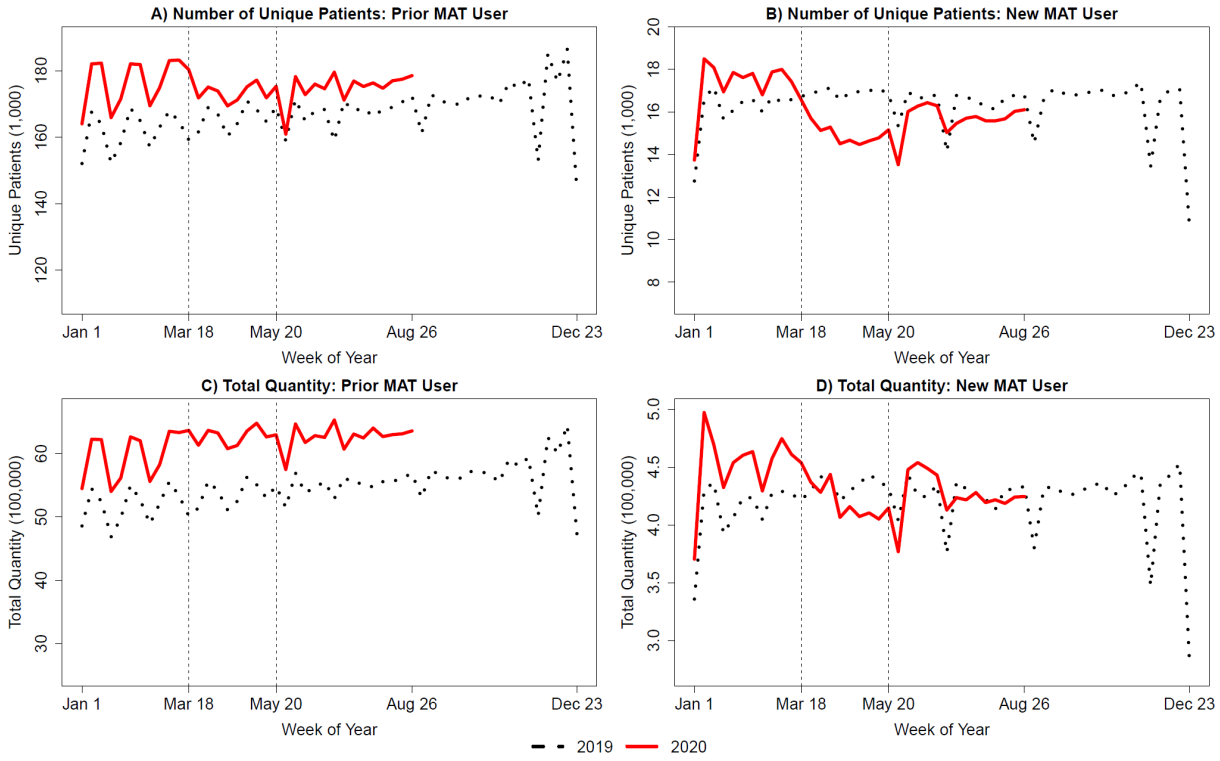
The figure plots total weekly prescription counts, total quantity, and quantity per prescription for medication-assisted treatment for opioid use disorders (MAT; specifically, buprenorphine and naltrexone) filled in 2018, 2019, and January 1 to September 1, 2020. Each data point represents the measure over a 7-day week period. The x-axis label refers to the first day of the week. Dotted vertical lines correspond to the week starting on March 18 and May 20, to coincide with the President's declaration of a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak, and the first week that the 7-day moving average of deaths had dropped below 1500 per day since early April 2020, respectively.

Figure 3. Weekly number of patients filling opioid analgesic prescriptions and total MMEs filled: existing versus new patients



The figure plots the number of unique patients filling any opioid analgesic prescription in a given week (Panels A and B) and total milligrams of morphine (MME) filled in a given week (Panels C and D) for prior opioid users and opioid-naïve patients. Patients are classified as opioid-naïve if they have not filled an opioid prescription in the past 365 days. Each data point represents the measure over a 7-day week period. The x-axis label refers to the first day of the week. Dotted vertical lines correspond to the week starting on March 18 and May 20, to coincide with the President's declaration of a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak, and the first week that the 7-day moving average of deaths had dropped below 1500 per day since early April 2020, respectively.

Figure 4. Weekly number of patients filling MAT prescriptions and total quantity filled: existing versus new patients



The figure plots the number of unique patients filling any medication-assisted treatment for opioid use disorders (MAT; specifically, buprenorphine and naltrexone) in a given week (Panels A and B) and total units in prescriptions filled in a given week (Panels C and D) for prior MAT users and new MAT users. A patient is classified as a new MAT user if they have not filled a MAT prescription in the past 365 days. Each data point represents the measure over a 7-day week period. The x-axis labels refer to the first day of the week. Dotted vertical lines correspond to the week starting on March 18 and May 20, to coincide with the President's declaration of a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak, and the first week that the 7-day moving average of deaths had dropped below 1500 per day since early April 2020, respectively.

Table 1. Expected and actual average weekly counts of prescription and patient measures from March 18-May 19 and May 20-September 1, 2020

	March 18 – May 19, 2020				May 20 – September 1, 2020			
	Expected 2020	Actual 2020	Actual/ Expected 2020	*P* value	Expected 2020	Actual 2020	Actual/ Expected 2020	*P* value
Prescriptions								
A. Opioid Analgesics								
# Prescriptions (thousands)	1,571.1 [1,499.9, 1,642.4]	1,410.0	0.90 [0.86, 0.94]	<.001	1,522.3 [1,450.6, 1,594.1]	1,570.9	1.03 [0.99, 1.08]	0.22
Total MME (millions)	1,057.4 [1,003.5, 1,111.3]	1,078.2	1.02 [0.97, 1.07]	0.24	1,000.1 [945.9, 1,054.4]	1,070.9	1.07 [1.02, 1.13]	0.02
MME per prescription	697 [686, 709]	799	1.15 [1.13, 1.17]	<.001	689 [677,700]	714	1.04 [1.02, 1.05]	<.001
Quantity per prescription	60.2 [59.5, 60.9]	67.0	1.11 [1.10, 1.13]	<.001	60.0 [59.3, 60.7]	61.5	1.03 [1.01, 1.04]	<.001
B. Medication-Assisted Treatment								
# Prescriptions (thousands)	207.3 [200.8, 213.8]	196,214	0.95 [0.92, 0.98]	<.001	209.9 [203.4, 216.4]	197,694	0.94 [0.91, 0.97]	<.001
Quantity (thousands)	6,540.7 [6,328.1, 6,753.4]	6,700.0	1.02 [0.99, 1.06]	0.16	6,711.9 [6,497.7, 6,926.1]	6,693.0	1.00 [0.97, 1.03]	0.87
Quantity per prescription	31.7 [,31.4,32.0]	34.1	1.08 [1.07, 1.09]	<.001	32,2 [31.9, 32.5]	33.9	1.05 [1.04, 1.06]	<.001
Patients								
C. Opioid Analgesics								
Prior user: total patients (thousands)	1,123.0 [1,077.8, 1,168.2]	1,077.4	0.96 [0.92, 1.00]	0.05	1,093.5 [1,048.3, 1,138.7]	1,110.3	1.02 [0.98, 1.06]	0.49
Opioid-naive: total patients (thousands)	406.8 [395.3, 418.4]	275.2	0.68 [0.66, 0.70]	<.001	399.7 [388.2, 411.3]	401.7	1.00 [0.98, 1.03]	0.75
Prior user: total MME (millions)	1,010.0 [952.8, 1,067.1]	1,027.3	1.02 [0.96, 1.08]	0.58	967.6 [910.4, 1,024.8]	1,005.9	1.04 [0.98, 1.10]	0.23
Opioid-naive: total MME (millions)	65.2 [62.0, 68.5]	50.9	0.78 [0.74, 0.82]	<.001	62.6 [59.4, 65.9]	65.0	1.04 [0.99, 1.09]	0.20
D. Medication-Assisted Treatment								
Prior user: total patients (thousands)	179.0 [175.0, 183.0]	174.0	0.97 [0.95, 0.99]	0.01	181.6 [177.5, 185.6]	175.0	0.96 [0.94, 0.99]	0.001
New user: total patients (thousands)	18.2 [17.5, 18.8]	15.1	0.83 [0.80, 0.86]	<.001	17.6 [17.0, 18.3]	15.6	0.89 [0.85, 0.92]	<.001
Prior user: total Quantity (thousands)	6,067.9 [5,824.5, 6,314.4]	6,277.0	1.03 [0.99, 1.08]	0.12	6,248.4 [6,001.9, 6,494.8]	6,267.7	1.00 [0.97, 1.04]	0.88
New user: total Quantity (thousands)	472.5 [450.7, 494.3]	423.0	0.90 [0.86, 0.94]	<.001	463.5 [441.8, 485.3]	425.3	0.92 [0.88, 0.96]	<.001

The table displays prescription and patient measures for opioid analgesics and medication-assisted treatment for opioid use disorders (MAT) over two time periods: March 18 – May 19, and May 20 – September 1. March 18 is the week following the President's declaration of a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak and May 20th is first week that the 7-day moving average of deaths had dropped below 1500 per day since April 2020. For each time period and outcome measure, we construct expected 2020 values based on predictions of a linear regression model using data from January 1, 2018 to March 3, 2020, controlling for week of the year, linear time trend in weeks from the start of our sample, and an indicator equal to one if a major holiday occurred during the week in question. Actual 2020 measures, and the ratio of actual to expected measures are also displayed. Two-sided 95% confidence intervals are displayed for these ratios. The P-values are for two-sided t-tests of whether the actual 2020 measure is equal to the expected value.

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