RESEARCH LETTER

Overdose-Related Cardiac Arrests Observed by Emergency Medical Services During the US COVID-19 Epidemic

The coronavirus disease 2019 (COVID-19) pandemic took grip of the US 2 decades into an accelerating overdose crisis that caused more than 70 000 deaths in 2019 alone.[1] Front-line health care professionals and officials have sounded the alarm that the social and economic fallout from the COVID-19 pandemic may impede efforts to flatten the overdose curve.[1,2] However, the state databases tracking overdose mortality often have long lags that stymie timely analysis and response.[3] Emergency medical services (EMS) data provide a novel source of near-real-time information to track epidemiological trends during the COVID-19 pandemic.[4,5] We leverage a large, national EMS database to characterize emergent trends in overdose mortality fueled by the pandemic.

Supplemental content

Methods | We conducted a retrospective observational analysis using the National EMS Information System (NEMSIS), a large registry of more than 10 000 EMS agencies in 47 states, which contribute data in near real time and represent more than 80% of EMS activations nationally in 2020.[5] We calculated weekly overdose-related cardiac arrests (determined on-site) and overdose-related EMS activations (determined by dispatch). In line with prior studies using NEMSIS data, we measured outcomes per EMS activations to adjust for call volume increases as new agencies join the system.[5] We compared 2020 values with a baseline, defined as the weekly average of 2018 and 2019 values. Excess values for 2020 were compared temporally with a cell phone–based mobility score—a measure of social distancing.[6] To account for potential pandemic-related decreases in call volume (the outcome denominator), we separately assessed trends using the average call volume for weeks 1 to 10 of 2020 (eMethods in the Supplement). This study was deemed exempt from review and informed consent by the UCLA Institutional Review Board.

Table. Characteristics of the National EMS Information System Database, 2018-2020

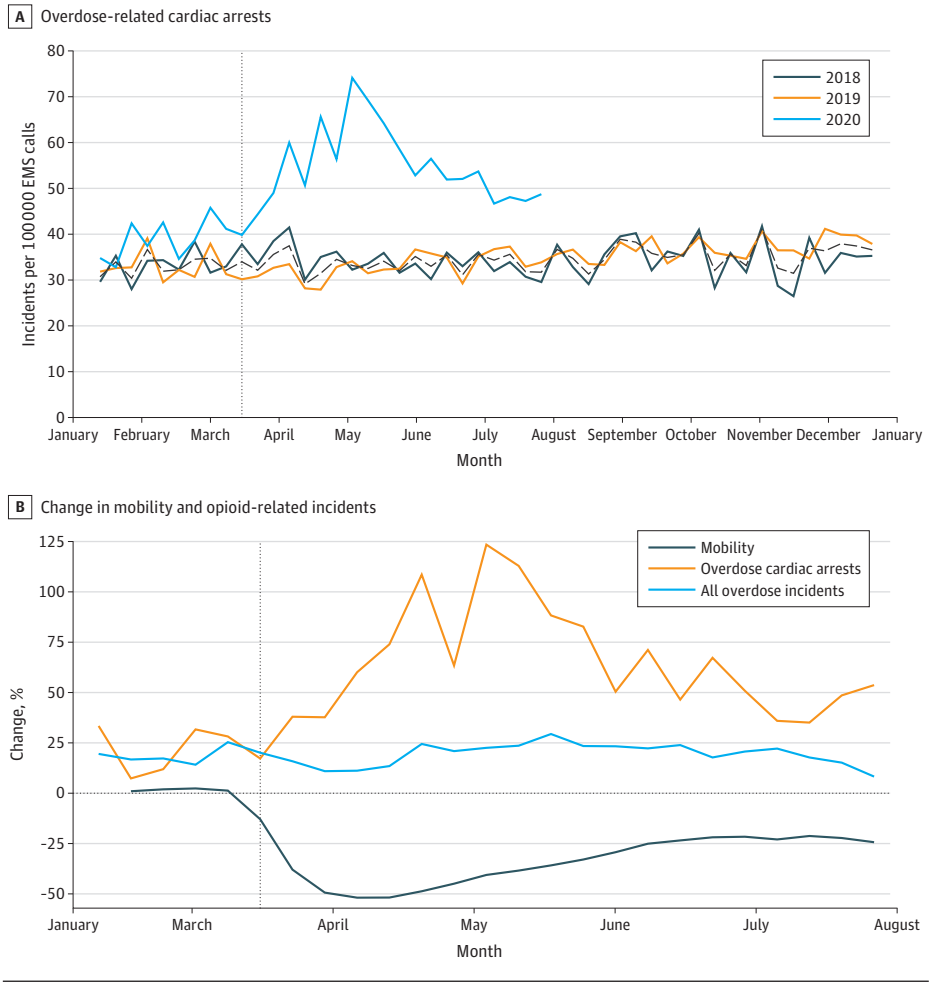
Characteristic[a]	EMS activations, No. (%) in millions		
	2020 (n = 25.9)	2019 (n = 36.1)	2018 (n = 26.3)
Age, y			
No.	21 904 630	30 560 105	22 178 238
≤17	1.2 (5.5)	1.9 (6.2)	1.4 (6.3)
18-60	9.7 (44.3)	13.3 (43.5)	9.8 (43.9)
≥61	11.0 (50.2)	15.4 (50.3)	11.0 (49.3)
Sex			
No.	22 028 271	30 803 060	22 512 209
Female	11.1 (50.5)	16.0 (51.8)	11.7 (52.1)
Male	10.9 (49.5)	14.8 (48.2)	10.8 (47.9)
Race/ethnicity			
No.	17 141 837	25 217 659	18 423 105
American Indian or Alaska Native	0.2 (1.1)	0.3 (1.1)	0.2 (1.0)
Asian	0.2 (1.2)	0.3 (1.3)	0.2 (1.3)
Black or African American	4.4 (25.4)	6.3 (25.0)	4.4 (23.9)
Hispanic or Latino	1.5 (8.8)	2.2 (8.8)	1.6 (8.6)
Native Hawaiian or other Pacific Islander	0.1 (0.3)	0.1 (0.4)	0.1 (0.4)
White	10.8 (63.2)	16.0 (63.4)	11.9 (64.8)
Census division			
No.	25 429 370	35 382 385	25 714 306
South Atlantic	8.0 (31.4)	11.6 (32.7)	7.4 (28.7)
Middle Atlantic	3.6 (14.2)	3.3 (8.9)	2.8 (10.9)
West South Central	3.5 (13.9)	4.7 (13.2)	3.5 (13.5)
Pacific	2.6 (10.4)	4.8 (13.6)	3.3 (12.8)
East North Central	2.1 (8.1)	3.5 (9.8)	2.8 (10.8)
Mountain	2.0 (7.8)	3.0 (8.5)	2.3 (9.1)
East South Central	1.6 (6.3)	1.9 (5.4)	1.6 (6.1)
West North Central	1.1 (4.4)	1.6 (4.4)	1.2 (4.6)
New England	0.9 (3.5)	1.2 (3.5)	0.9 (3.5)
Territories	<0.1 (0)	<0.1 (0.1)	<0.1 (0.1)

[a] Patient age category, sex, race/ethnicity, and census division where the incident occurred are shown. Counts for 2020 represent January through August. Missing values can be ascertained as the difference between each year's total and the variable-specific total.

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Figure. Changes in Emergency Medical Services (EMS)–Observed Overdose Incidents, Cardiac Arrests, and Mobility During the US Coronavirus Disease 2019 (COVID-19) Epidemic



A, Overdose-related cardiac arrests per 100 000 EMS calls for 2018 through August 2020. The average of 2018 and 2019 values is treated as a baseline trend and is shown as a dotted black line. B, Excess in overdose-related cardiac arrests (elevation in 2020 over baseline values) as well as the excess in all overdose-related EMS calls alongside changes in mobility (a measure of social distancing, obtained from the Institute for Health Metrics and Evaluation). The vertical dashed line marks the week of March 16, 2020, the first week in which mobility markedly decreased nationally in the US.

Results | The 2020 NEMSIS database represents 25.9 million EMS activations, 50.5% from female patients and 50.2% from patients 61 years or older (**Table**). Overdose-related cardiac arrests rose sharply during April 2020, reaching 74.1 per 100 000 EMS activations (123.4% above baseline) by May 4 (**Figure**). Overdose-related cardiac arrests subsequently decreased but remained elevated, reaching 48.7 per 100 000 EMS activations (53.7% above baseline) by July 27. Overall, through August 1, overdose-related cardiac arrests in 2020 totaled 49.5 per 100 000 EMS activations (48.5% above baseline). These trends corresponded temporally with a sharp drop in mobility beginning March 16, reaching a minimum of −51.8% of baseline by April 13 and slowly increasing to −24.3% by July 27. Weekly rates of overdose-related EMS activations were elevated in 2020; however, values were largely similar before and during reductions in mobility, with 1635.2 per 100 000 EMS activations before March 16 and 1760.7 per 100 000 EMS activations after March 16 (18.5% and 16.7%, respectively, relative to baseline).

Discussion | We describe a large-magnitude, national surge in overdose-related cardiac arrest during the initial months of the COVID-19 epidemic in the US. Peak rates in May 2020 were more than double the baseline from 2018 and 2019, and overall 2020 values were elevated by approximately 50%. The temporal similarities to decreased mobility suggest that the fallout from the COVID-19 pandemic—perhaps especially social isolation—is sharply accelerating fatal overdose trends. The lack of a commensurate sharp increase in total (fatal and nonfatal) overdose incidents could indicate a rising overdose case fatality rate in a context of more stable, albeit elevated, overdose rates. Many of the trends predicted by public health experts at the outset of the pandemic, such as an increased proportion of individuals using substances alone, increased toxification of the drug supply, and reduced access to treatment, could increase the lethality of each overdose incident.[2]

These findings are limited, as they reflect a large cohort of EMS agencies for which geographic identifiers below census division are not available that may not capture all nuances of recent epidemiological trends in the US.[5] Additionally, shifts in the proportion of overdoses observed nationally by EMS could bias our results up or down. Confirmatory results should be sought as detailed vital registration data become available. Nevertheless, shifts observed here suggest that measures to address the pandemic have largely failed to

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mitigate overdose risk. These trends implicate investments in substance use treatment, harm reduction, and structural drivers of overdose as core elements of COVID-19 response.

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Author Contributions: Mr Friedman had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
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Acquisition, analysis, or interpretation of data: All authors.
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Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Friedman, Schriger.
Administrative, technical, or material support: Friedman.
Study supervision: All authors.

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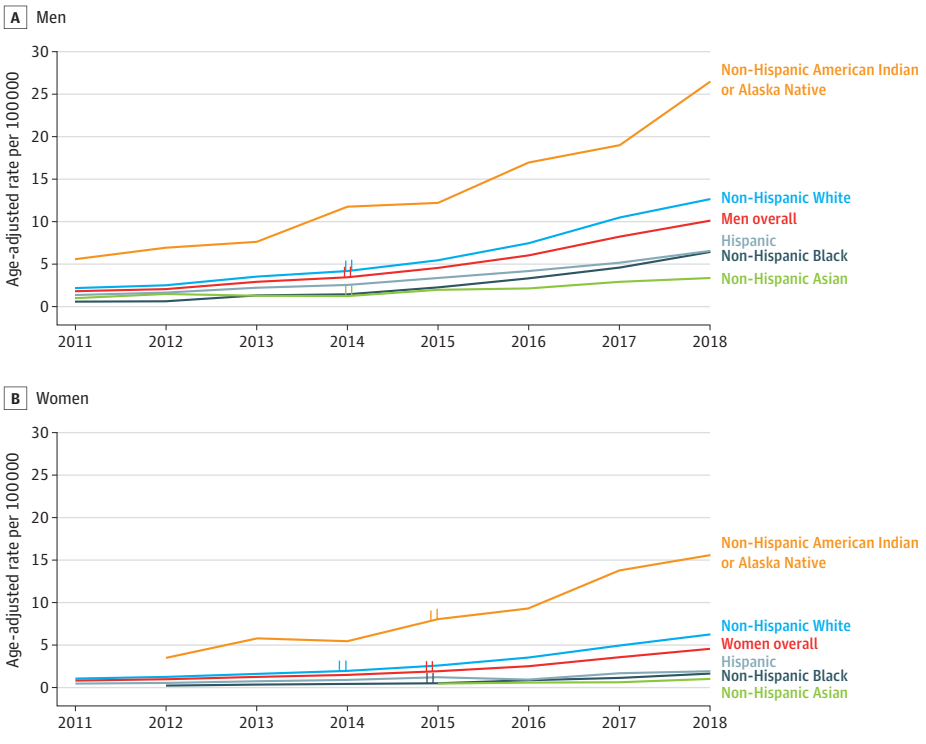
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Methamphetamine Overdose Deaths in the US by Sex and Race and Ethnicity

US age-adjusted rates of drug overdose deaths involving methamphetamine increased nearly 5-fold during 2012-2018.[1] Although addiction outcomes can be improved with

Figure. Trends in Methamphetamine Deaths Among US Men and Women Aged 25-54 Years Overall and by Race and Ethnicity



Joinpoints identified indicate significant changes in nonlinear trends using bayesian information criteria. Annual percentage change trends are detailed in the Table.

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