



Short communication

## Nonfatal opioid-related overdoses treated by emergency medical services in Florida, before and during the COVID-19 pandemic

Melissa K. Ward<sup>a,b,\*</sup>, Tendai Gwanzura<sup>a</sup>, Roberto R. Rojas<sup>a</sup>, Mary Jo Trepka<sup>a,b</sup>,  
Zoran Bursac<sup>b,c</sup>, Eric F. Wagner<sup>b,d,e</sup>

<sup>a</sup> Department of Epidemiology, Robert Stempel College of Public Health and Social Work, Florida International University, Miami, FL, USA

<sup>b</sup> Research Center in Minority Institutions, Florida International University, Miami, FL, USA

<sup>c</sup> Department of Biostatistics, Robert Stempel College of Public Health and Social Work, Florida International University, Miami, FL, USA

<sup>d</sup> School of Social Work, Robert Stempel College of Public Health and Social Work, Florida International University, Miami, FL, USA

<sup>e</sup> Community-Based Research Institute, Florida International University, Miami, FL, USA

## ARTICLE INFO

## Keywords:

COVID-19

Opioid epidemic

Opioid-related disorders

Naloxone

Emergency medical services

Florida

## ABSTRACT

Previous studies have found increases in nonfatal opioid overdoses during the COVID-19 pandemic, which created difficult conditions for people with substance use disorders. We assessed changes in nonfatal opioid-related overdoses in Florida during the onset of the COVID-19 pandemic. Emergency medical service data was obtained from the Florida Department of Health. Naloxone administration with documented improvement was used as a proxy for nonfatal opioid-related overdoses. Age-adjusted rates were estimated per 100,000 population for April-September 2020 (n = 9,377) and compared to the same time period during 2019 (n = 6,765) using rate ratios. Age-adjusted rates were estimated by sex, race/ethnicity, and metro/nonmetro county classification, as well as county-level measures of medications for opioid use disorder (MOUD) availability, rates of COVID-19 deaths, and unemployment during 2020. The age-adjusted rate of nonfatal opioid-related overdoses increased from 32.41 (95 % CL: 31.64–33.19) during 2019 to 45.35 (95 % CL: 44.42–46.27) during 2020 (RR = 1.40; 95 % CL: 1.36–1.44). The rate for males increased most in metro counties (RR = 1.47, 95 % CL: 1.41–1.53); the rate for females increased most in nonmetro counties (RR = 1.51, 95 % CL: 1.10–2.06). The largest increases were observed among Hispanics (males: RR = 1.56, 95 % CL: 1.37–1.78; females: RR = 1.44, 95 % CL: 1.14–1.81), counties with no MOUD treatment options (RR = 1.66, 95 % CL: 1.14–2.44) and counties with the lowest rates of buprenorphine prescribers (RR = 1.70, 95 % CL: 1.29–2.22). Nonfatal opioid-related overdoses increased in Florida during the first six months of the COVID-19 pandemic. Expanding access to services that support treatment and recovery is critical to addressing the ongoing opioid crisis in Florida.

## 1. Introduction

Social disruptions resulting from COVID-19 and the necessary measures to control its spread created challenging conditions for individuals struggling with or in recovery from substance use disorders. (Volkow, 2020) Simulation studies have found increased opioid-related overdose deaths during the pandemic compared to what would have been expected in the absence of the pandemic (Linás et al., 2021; Rodda et al., 2020). According to the Centers for Disease Control and Prevention's (CDC) Drug Overdose Surveillance and Epidemiology System, nonfatal opioid-related overdoses increased 37 % from January 2020 to January 2021 in 39 U.S. states with available data (Centers for Disease Control

and Prevention, 2022).

Naloxone is an opioid antagonist that reverses the effects of opioid-related overdoses (National Institute on Drug Abuse, 2022). Given the specificity of naloxone's mechanism of action, an individual who is not experiencing an opioid-related overdose will not respond to it (National Institute on Drug Abuse, 2022). Therefore, naloxone administration with documented improvement serves as a proxy indicator for nonfatal opioid-related overdoses (Council of State and Territorial Epidemiologists, 2022; Council of State and Territorial Epidemiologists, 2022). This descriptive study compares nonfatal opioid-related overdoses in Florida (using naloxone distribution by emergency medical services as a proxy) during the first six months of the COVID-19 pandemic to the same time

\* Corresponding author.

E-mail address: [mward@fiu.edu](mailto:mward@fiu.edu) (M.K. Ward).

<https://doi.org/10.1016/j.pmedr.2022.102102>

Received 21 December 2022; Received in revised form 23 December 2022; Accepted 24 December 2022

Available online 26 December 2022

2211-3355/© 2022 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

period in 2019 to examine which groups experienced the steepest increases and to characterize groups that may require additional support.

## 2. Methods

Records from the Florida Emergency Medical Services Tracking and Reporting System (EMSTARS) indicating naloxone distribution were obtained from the Florida Department of Health (FDOH). EMSTARS is a voluntary program; records received by FDOH include all emergency medical services (EMS) responses submitted by participating agencies throughout Florida, representing 90 % of EMS call volume in 2019 and 2020 (email communication, Bureau of Emergency Medical Oversight, FDOH, May 2022). EMSTARS collects a subset of nationally recognized EMS data from the National Emergency Medical Services Information System (Florida Department of Health. *Prehospital Data Collection and Reporting System, 2021*). Naloxone distribution was identified using the Medication Given field of the EMSTARS database (Florida Emergency Medical Services Advisory Committee, 2022).

Administration of naloxone and documented improvement was used as a proxy for nonfatal opioid-related overdoses; only the first administration with documented improvement per episode was included (to remove multiple observations per episode). Analyses for both years were limited to records with information on age and sex, and those with home zip codes in Florida (In 2019, 471 of 7,236 total episodes, or 6.5 %, were excluded for missing data on zip codes, having a home zip code outside of Florida, or missing data on age or sex. Similarly, in 2020, 696 of 10,073 episodes, or 6.9 %, were excluded for these reasons). Age-adjusted rates were estimated for the six months following the onset of the COVID-19 pandemic in 2020 (April–September; Florida’s stay-at-home order was issued on March 16, 2020) and compared to the same time period in 2019. Population denominators were derived from 2019 5-year American Community Survey estimates by county, sex, and age group (United States Census Bureau (2009–2020)).

Age-adjusted rates were stratified by sex and further examined by race/ethnicity (Black/African American, Hispanic, and White) and county designation as metro (urban) or non-metro (rural) areas (as classified by the Office of Management and Budget) (U.S. Department of Agriculture Economic Research Service, 2020). Age-adjusted rates were also analyzed by county-level measures: indicators of the availability of medications for opioid use disorder (MOUD), quartiles of rates of COVID-19 deaths per 100,000 population, April–September 2020 (from CDC WONDER provisional mortality estimates), (Centers for Disease Control and Prevention, 2018) and quartiles of the average unemployment rate from April–September 2020 (from Local Area Unemployment Statistics, Florida Department of Economic Opportunity) (Florida Department of Economic Opportunity, 2022). Data on MOUD availability and buprenorphine prescribers were extracted from information for Florida included in the SAMHSA Behavioral Health Treatment Locator as of March 27, 2020 (Substance Abuse and Mental Health Services Administration, 2022). We analyzed two county-level indicators of MOUD availability: the number of MOUD options (buprenorphine, methadone, or naltrexone) available (ranging from 0 to 3) and quartiles of the rate of buprenorphine prescribers per 100,000 population. Quartiles of rates of COVID-19 deaths and of average unemployment rates were included as proxy measures of the impact of the COVID-19 pandemic on mortality and unemployment during the six months following the onset of the pandemic; first quartiles for these measures indicate counties that experienced the highest levels of mortality and unemployment from April–September 2020.

## 3. Statistical analyses

Age-adjusted rates per 100,000 population were estimated for each year using the direct standardization method utilizing PROC STD RATE in SAS 9.4; 2019 American Community Survey estimates of the U.S. population by age and sex served as the standard population (United

States Census Bureau, 2009–2020). Rate ratios comparing 2020 to 2019 were estimated with 95 % confidence limits using Mantel-Haenszel effect estimation in PROC STD RATE. This study was approved by the Florida International University Social and Behavioral Institutional Review Board.

## 4. Results

Table A1 describes episodes of nonfatal opioid-related overdoses treated by Florida EMS during April–September of 2019 and 2020. A total of 6,765 episodes with home zip codes in Florida and with data on age and sex were recorded during 2019, increasing to 9,377 in 2020. The distribution of episodes was similar in both years: >60 % occurred in males, and >50 % occurred in ages 25–44 years old. Most episodes occurred in people identified as White, followed by Black/African American and Hispanic.

Table 1 shows age-adjusted rates and rate ratios for the observed time periods; Table 2 shows these results by sex. Overall, the age-adjusted rate of nonfatal opioid-related overdoses per 100,000 increased from 32.41 (95 % CL: 31.64–33.19) in 2019 to 45.35 (95 % CL: 44.42–46.27) during the same time period in 2020 (rate ratio (RR) = 1.40; 95 % CL: 1.36–1.44). Among males, the age-adjusted rate during 2020 was 61.31 per 100,000 (95 % CL: 59.78–62.84), representing a rate ratio of 1.47 (95 % CL: 1.41–1.53) compared to 2019. Among females, the age-adjusted rate during 2020 was 29.97 per 100,000 (95 % CL: 28.93–31.02), representing a rate ratio of 1.28 (95 % CL: 1.21–1.35) compared to 2019. Among males, those in metro counties experienced the highest increase (RR = 1.47, 95 % CL: 1.41–1.53), while among females, those in nonmetro counties experienced the highest increase (RR = 1.51, 95 % CL: 1.10–2.06). Although the highest rates of nonfatal opioid-related overdoses occurred among White males and females during April–September 2020 (90.66 and 48.17, respectively) the highest rate ratios compared to 2019 were observed among Hispanics (among males: RR = 1.56, 95 % CL: 1.37–1.78; among females: RR = 1.44, 95 % CL: 1.14–1.81).

Overall, the highest increases from 2019 to 2020 occurred in counties with no MOUD treatment options (RR = 1.66, 95 % CL: 1.14–2.44) and counties with the lowest rates of buprenorphine prescribers per 100,000 population (RR = 1.70, 95 % CL: 1.29–2.22). Counties with no MOUD treatment options had the highest rate of nonfatal opioid-related overdoses for females during 2020 (39.42, 95 % CL: 26.21–52.64); conversely, counties with three MOUD treatment options had the highest rate of nonfatal overdoses for males (64.67, 95 % CL: 62.96–66.39). The largest increases in age-adjusted rates of nonfatal overdoses were observed in counties in the third quartile of rates of COVID deaths (RR = 1.48, 95 % CL: 1.42–1.54) and the fourth quartile of average unemployment rates during April–September 2020 (RR = 1.77, 95 % CL: 1.32–2.37).

## 5. Discussion

Age-adjusted rates of nonfatal opioid-related overdoses increased among all groups in Florida when comparing April–September 2020 to the same time period in 2019 and using EMS-administered naloxone as a proxy measure. These findings align with previous studies examining EMS and emergency department data, which found an increase in nonfatal opioid overdoses during the COVID-19 pandemic (Khoury et al., 2021; Ochalek et al., 2020; Soares et al., 2021; Slavova et al., 2020). Our findings suggest women in rural counties; Hispanics, and people living in counties with limited OUD treatment options may have been particularly impacted by increases in opioid-related overdoses during the early months of the pandemic, relative to the same time period in the previous year. This study adds to previous analyses by providing estimates of age-adjusted rates by sex, race/ethnicity, and indicators of service availability (Florida Drug Overdose Surveillance and Epidemiology, 2019).

**Table 1**  
Age-standardized rates of nonfatal opioid-related overdoses<sup>a</sup> treated by EMS responders, Florida, April-September 2019 and 2020.

	2019		2020		Rate Ratio (95 % CL)
	n	Rate (95 % CL)	n	Rate (95 % CL)	
<b>Overall</b>	6765	32.41 (31.64, 33.19)	9377	45.35 (44.42, 46.27)	<b>1.40 (1.36, 1.44)</b>
<b>Race/Ethnicity<sup>b</sup></b>					
Black/African American	684	21.80 (20.14, 23.45)	944	29.75 (27.82, 31.67)	<b>1.36 (1.24, 1.51)</b>
Hispanic/Latino	499	9.26 (8.43, 10.08)	783	14.20 (13.19, 15.21)	<b>1.53 (1.37, 1.72)</b>
White	4942	46.86 (45.52, 48.20)	7153	69.21 (67.57, 70.84)	<b>1.48 (1.42, 1.53)</b>
<b>Characteristics of Counties where Episodes of Nonfatal Opioid-Related Overdoses Occurred</b>					
<b>Rural/Urban Classification</b>					
Metro	6608	32.79 (32.00, 33.59)	9154	45.85 (44.91, 46.79)	<b>1.40 (1.35, 1.44)</b>
Non-metro	157	21.54 (18.15, 24.93)	223	31.04 (26.94, 35.13)	<b>1.44 (1.17, 1.77)</b>
<b>MOUD Treatment Options Available</b>					
0 of 3 MOUD Options	42	21.28 (14.83, 27.73)	71	35.42 (27.14, 43.70)	<b>1.66 (1.14, 2.44)</b>
1 of 3 MOUD Options	144	30.46 (25.21, 35.71)	156	37.50 (31.44, 43.54)	<b>1.23 (0.97, 1.56)</b>
2 of 3 MOUD Options	658	25.84 (23.83, 27.84)	878	35.01 (32.66, 37.35)	<b>1.35 (1.22, 1.50)</b>
3 of 3 MOUD Options	5921	33.56 (32.70, 34.42)	8272	47.22 (46.20, 48.24)	<b>1.41 (1.36, 1.45)</b>
<b>Buprenorphine Prescriber Rate per 100,000</b>					
1st Quartile (>11.4–18.9)	2145	30.99 (29.67, 32.31)	2846	41.48 (39.95, 43.01)	<b>1.34 (1.27, 1.42)</b>
2nd Quartile (>7.7–11.4)	3177	43.55 (42.03, 45.07)	4452	61.58 (59.77, 63.40)	<b>1.41 (1.35, 1.48)</b>
3rd Quartile (>4.8–7.7)	1359	22.32 (21.13, 23.52)	1936	32.18 (30.74, 33.62)	<b>1.44 (1.34, 1.55)</b>
4th Quartile (≤4.8)	84	15.79 (12.39, 19.19)	143	26.77 (22.34, 31.20)	<b>1.70 (1.29, 2.22)</b>
<b>Rate of COVID-19 Deaths per 100,000, April-September 2020</b>					
1st Quartile (>75.9–215.6)	947	18.19 (17.02, 19.35)	1110	21.40 (20.14, 22.67)	<b>1.18 (1.08, 1.28)</b>
2nd Quartile (>54.9–75.9)	1089	20.40 (19.17, 21.62)	1467	28.18 (26.73, 29.63)	<b>1.38 (1.28, 1.50)</b>
3rd Quartile (>38.3–54.9)	3424		5027		

**Table 1 (continued)**

	2019		2020		Rate Ratio (95 % CL)
	n	Rate (95 % CL)	n	Rate (95 % CL)	
4th Quartile (≤38.3)		49.08 (47.43, 50.73)		72.58 (70.56, 74.60)	<b>1.48 (1.42, 1.54)</b>
	1305	39.35 (37.21, 41.48)	1773	53.42 (50.94, 55.91)	<b>1.36 (1.26, 1.46)</b>
	<b>Average Unemployment Rate, April-September 2020</b>				
	2047	23.22 (22.21, 24.23)	2499	28.80 (27.66, 29.93)	<b>1.24 (1.17, 1.32)</b>
1st Quartile (>10.9–21.4 %)	4064	42.00 (40.67, 43.26)	5968	62.00 (60.42, 63.58)	<b>1.48 (1.42, 1.54)</b>
2nd Quartile (>9.1–10.9 %)	584	32.40 (29.77, 35.03)	786	44.03 (40.94, 47.11)	<b>1.36 (1.22, 1.51)</b>
3rd Quartile (>7.7–9.1 %)	70	12.90 (9.87, 15.93)	124	22.83 (18.80, 26.86)	<b>1.77 (1.32, 2.37)</b>
4th Quartile (≤7.7 %)					

CL, confidence limit; MOUD, medication for opioid use disorder. Boldface indicates statistically significant rate ratios (confidence limit does not include 1).

aAdministration of naloxone and documented improvement was used as a proxy for nonfatal opioid-related overdoses.

<sup>b</sup>In 2019, data on race/ethnicity was not available for 451 episodes (6.7%). In 2020, race/ethnicity was not available for 379 episodes (4.0%). To align with U. S. Census Bureau definitions of race/ethnicity, episodes identified as more than one race/ethnicity by EMS responders were classified as African American/Black if this category was selected at least once. Next, episodes were classified as Hispanic if this category was selected at least once. Finally, episodes were classified as White if neither African American/Black or Hispanic was selected. In 2019, a total of 74 episodes (1.1%) originally had more than one race/ethnicity designation. In 2020, a total of 61 episodes (0.7%) originally had more than one race/ethnicity designation.

The opioid crisis is often thought of as a public health problem primarily affecting white males (National Institute on Drug Abuse, 2022; QuickStats, 2000–2020). While this is certainly true, the results of this study align with recent literature showing that other groups have also experienced sharp increases in opioid-related overdoses (Kariisa et al., 2022; Laroche et al., 2021; Hoopsick et al., 2021). In this study, white females had the highest age-adjusted rates after white males in 2020, followed by Black/African American and Hispanic males. Additionally, our finding that among males in 2020, the highest rate of nonfatal opioid-related overdoses occurred in Florida counties that offered all three MOUD options may indicate that resources have been focused on areas where males are most in need. This stands in sharp contrast to our finding relating to females, where the highest rates of nonfatal opioid-related overdoses in 2020 occurred in counties with no MOUD options available. It is critical that outreach and intervention efforts are culturally tailored and consider gender-specific needs in order to address the unique impact of the opioid crisis across multiple groups.

This study is subject to limitations. Data on race/ethnicity was missing for 6.7 % of observations in 2019 and for 4.0 % of observations in 2020, which may have affected our estimates by race/ethnicity. The authors did not have access to data from Florida's prescription drug monitoring program, which may have provided additional information related to changes in MOUD dispensing practices during the COVID-19 pandemic. Results presented here are likely underestimates of nonfatal opioid-related overdoses in Florida because they only include overdoses treated by EMS. Documented improvement may have occurred after the

**Table 2a**  
Age-standardized rates of nonfatal opioid-related overdoses<sup>a</sup> by sex, Florida, April-September 2019 and 2020.

	MALE				
	2019		2020		Rate ratio (95 % CL)
	n	Rate (95 % CL)	n	Rate (95 % CL)	
<b>Overall</b>	4247	41.72 (40.46, 42.98)	6180	61.31 (59.78, 62.84)	<b>1.47 (1.41, 1.53)</b>
<b>Race/Ethnicity<sup>b</sup></b>					
Black/African American	463	31.18 (28.30, 34.06)	669	44.53 (41.11, 47.95)	<b>1.43 (1.27, 1.61)</b>
Hispanic/Latino	374	13.90 (12.46, 15.43)	600	21.68 (19.92, 23.44)	<b>1.56 (1.37, 1.78)</b>
White	2996	58.34 (56.20, 60.48)	4567	90.66 (87.98, 93.34)	<b>1.55 (1.48, 1.63)</b>
<b>Characteristics of Counties where Episodes of Nonfatal Opioid-Related Overdoses Occurred</b>					
<b>Rural/Urban Classification</b>					
Metro	4157	42.48 (41.19, 43.78)	6053	62.49 (60.91, 64.07)	<b>1.47 (1.41, 1.53)</b>
Non-metro	90	22.96 (18.19, 27.72)	127	32.16 (26.54, 37.77)	<b>1.40 (1.07, 1.84)</b>
<b>MOUD Treatment Options Available</b>					
0 of 3 MOUD Options	20	18.32 (10.27, 26.37)	36	32.23 (21.67, 42.79)	<b>1.76 (1.02, 3.04)</b>
1 of 3 MOUD Options	77	33.23 (25.59, 40.87)	94	41.98 (33.31, 50.64)	1.26 (0.93, 1.72)
2 of 3 MOUD Options	412	32.91 (29.69, 36.13)	559	45.00 (41.24, 48.77)	<b>1.37 (1.20, 1.56)</b>
3 of 3 MOUD Options	3738	43.65 (42.24, 45.05)	5491	64.67 (62.96, 66.39)	<b>1.48 (1.42, 1.54)</b>
<b>Buprenorphine Prescriber Rate per 100,000</b>					
1st Quartile (>11.4–18.9)	1381	41.02 (38.85, 43.19)	1922	57.70 (55.11, 60.29)	<b>1.41 (1.31, 1.51)</b>
2nd Quartile (>7.7–11.4)	1976	55.91 (53.43, 58.39)	2927	83.68 (80.64, 86.72)	<b>1.50 (1.41, 1.59)</b>
3rd Quartile (>4.8–7.7)	849	28.55 (26.62, 30.48)	1251	42.51 (40.15, 44.87)	<b>1.49 (1.36, 1.62)</b>
4th Quartile (≤4.8)	41	14.50 (10.04, 18.96)	80	27.77 (21.65, 33.89)	<b>1.92 (1.31, 2.80)</b>
<b>Rate of COVID-19 Deaths per 100,000, April-September 2020</b>					
1st Quartile (>75.9–215.6)	620	24.24 (22.32, 26.15)	745	29.23 (27.11, 31.32)	<b>1.21 (1.08, 1.34)</b>
2nd Quartile (>54.9–75.9)	657	25.33 (23.78, 27.29)	957	38.02 (35.59, 40.44)	<b>1.50 (1.36, 1.66)</b>
	2122		3316		

**Table 2a (continued)**

	MALE				
	2019		2020		Rate ratio (95 % CL)
	n	Rate (95 % CL)	n	Rate (95 % CL)	
3rd Quartile (>38.3–54.9)		62.63 (59.95, 65.30)		98.55 (95.18, 101.9)	<b>1.57 (1.49, 1.66)</b>
4th Quartile (≤38.3)	848	51.94 (48.44, 55.44)	1162	71.25 (67.15, 75.35)	<b>1.38 (1.26, 1.50)</b>
<b>Average Unemployment Rate, April-September 2020</b>					
1st Quartile (>10.9–21.4 %)	1347	31.45 (29.76, 33.13)	1718	40.78 (38.85, 42.71)	<b>1.30 (1.21, 1.39)</b>
2nd Quartile (>9.1–10.9 %)	2512	53.56 (51.46, 55.67)	3909	83.86 (81.22, 86.50)	<b>1.57 (1.49, 1.65)</b>
3rd Quartile (>7.7–9.1 %)	354	39.44 (35.32, 43.55)	480	54.11 (49.26, 58.95)	<b>1.37 (1.20, 1.57)</b>
4th Quartile (≤7.7 %)	34	11.69 (7.75, 15.63)	73	24.56 (18.91, 30.20)	<b>2.10 (1.40, 3.16)</b>

CL, confidence limit; MOUD, medication for opioid use disorder. Boldface indicates statistically significant rate ratios (confidence limit does not include 1).

<sup>a</sup>Administration of naloxone and documented improvement was used as a proxy for nonfatal opioid-related overdoses.

<sup>b</sup>In 2019, data on race/ethnicity was not available for 451 episodes (6.7%). In 2020, race/ethnicity was not available for 379 episodes (4.0%). To align with U. S. Census Bureau definitions of race/ethnicity, episodes identified as more than one race/ethnicity by EMS responders were classified as African American/Black if this category was selected at least once. Next, episodes were classified as Hispanic if this category was selected at least once. Finally, episodes were classified as White if neither African American/Black or Hispanic was selected. In 2019, a total of 74 episodes (1.1%) originally had more than one race/ethnicity designation. In 2020, a total of 61 episodes (0.7%) originally had more than one race/ethnicity designation.

EMS encounter in the emergency department. Alternatively, naloxone may have been administered by community members outside of EMS encounters altogether. The analyses presented here would not include such cases. Additionally, data reported to Florida EMSTARs is estimated to include 90 % of EMS call volume in 2019 and 2020 (email communication, Bureau of Emergency Medical Oversight, FDOH, May 2022). Effect estimates may be impacted if the distribution of overdoses among the 10 % of EMS calls not accounted for in this study differs substantially from the EMS calls analyzed.

**6. Conclusion**

Nonfatal opioid-related overdoses increased in Florida during the first six months of the COVID-19 pandemic. Expanding access to services that support treatment and recovery for groups that have not traditionally been the focus of outreach efforts is critical to addressing the ongoing opioid crisis in Florida.

**CRedit authorship contribution statement**

**Melissa K. Ward:** Funding acquisition, Conceptualization, Methodology, Formal analysis, Data curation, Writing – original draft, Writing – review & editing, Supervision. **Tendai Gwanzura:** Data curation, Writing – original draft, Writing – review & editing. **Roberto R. Rojas:** Data curation, Writing – review & editing. **Mary Jo Trepka:**

**Table 2b**

Ctd. age-standardized rates of nonfatal opioid-related overdoses<sup>a</sup> by sex Florida, April-September 2019 and 2020.

	FEMALE				
	2019		2020		Rate Ratio (95 % CL)
	n	Rate (95 % CL)	n	Rate (95 % CL)	
<b>Overall</b>	2518	23.44 (22.52, 24.36)	3197	29.97 (28.93, 31.02)	<b>1.28 (1.21, 1.35)</b>
<b>Race/Ethnicity<sup>b</sup></b>					
Black/African American	221	13.51 (11.70, 15.32)	275	16.63 (14.64, 18.63)	<b>1.23 (1.03, 1.47)</b>
Hispanic/Latino	125	4.73 (3.89, 5.57)	183	6.82 (5.82, 7.82)	<b>1.44 (1.14, 1.81)</b>
White	1946	35.59 (33.96, 37.22)	2586	48.17 (46.26, 50.08)	<b>1.35 (1.27, 1.44)</b>
<b>Characteristics of Counties where Episodes of Nonfatal Opioid-Related Overdoses Occurred</b>					
<b>Rural/Urban Classification</b>					
Metro	2451	23.54 (22.61, 24.48)	3101	29.98 (28.92, 31.04)	<b>1.27 (1.21, 1.34)</b>
Non-metro	67	19.60 (14.86, 24.35)	96	29.53 (23.55, 35.50)	<b>1.51 (1.10, 2.06)</b>
<b>MOUD Treatment Options Available</b>					
0 of 3 MOUD Options	22	24.77 (14.36, 35.21)	35	39.42 (26.21, 52.64)	1.59 (0.93, 2.73)
1 of 3 MOUD Options	67	26.91 (19.90, 33.91)	62	31.76 (23.53, 39.99)	1.18 (0.82, 1.70)
2 of 3 MOUD Options	246	18.73 (16.34, 21.11)	319	25.11 (22.31, 27.91)	<b>1.34 (1.13, 1.59)</b>
3 of 3 MOUD Options	2183	23.98 (22.97, 24.99)	2781	30.65 (29.51, 31.79)	<b>1.28 (1.21, 1.35)</b>
<b>Buprenorphine Prescriber Rate per 100,000</b>					
1st Quartile (>11.4–18.9)	764	21.40 (19.88, 22.93)	924	25.97 (24.29, 27.66)	<b>1.21 (1.10, 1.34)</b>
2nd Quartile (>7.7–11.4)	1201	31.81 (30.01, 33.62)	1525	40.66 (38.61, 42.71)	<b>1.28 (1.18, 1.38)</b>
3rd Quartile (>4.8–7.7)	510	16.31 (14.88, 17.73)	685	22.18 (20.51, 23.85)	<b>1.36 (1.21, 1.53)</b>
4th Quartile (≤4.8)	43	17.15 (11.95, 22.35)	63	25.20 (18.87, 31.53)	1.47 (0.99, 2.18)
<b>Rate of COVID-19 Deaths per 100,000, April-September 2020</b>					
1st Quartile (>75.9–215.6)	327	12.28 (10.94, 13.62)	365	13.73 (12.31, 15.15)	1.11 (0.96, 1.30)
2nd Quartile (>54.9–75.9)	432	15.67 (14.18, 17.16)	510	18.78 (17.13, 20.42)	<b>1.20 (1.05, 1.36)</b>

**Table 2b (continued)**

	FEMALE				Rate Ratio (95 % CL)
	2019		2020		
	n	Rate (95 % CL)	n	Rate (95 % CL)	
3rd Quartile (>38.3–54.9)	1302	36.13 (34.15, 38.10)	1711	47.78 (45.51, 50.06)	<b>1.32 (1.23, 1.42)</b>
4th Quartile (≤38.3)	457	27.21 (24.71, 29.70)	611	36.30 (33.42, 39.18)	<b>1.33 (1.18, 1.51)</b>
<b>Average Unemployment Rate, April-September 2020</b>					
1st Quartile (>10.9–21.4 %)	700	15.36 (14.22, 16.51)	781	17.37 (16.14, 18.59)	<b>1.13 (1.02, 1.25)</b>
2nd Quartile (>9.1–10.9 %)	1522	30.95 (29.40, 32.50)	2059	41.22 (39.43, 43.01)	<b>1.33 (1.25, 1.42)</b>
3rd Quartile (>7.7–9.1 %)	230	25.34 (22.06, 28.62)	306	34.04 (30.22, 37.86)	<b>1.34 (1.13, 1.59)</b>
4th Quartile (≤7.7 %)	36	14.17 (9.50, 18.83)	51	20.23 (14.64, 25.82)	1.43 (0.93, 2.19)

CL, confidence limit; MOUD, medication for opioid use disorder.

Boldface indicates statistically significant rate ratios (confidence limit does not include 1).

aAdministration of naloxone and documented improvement was used as a proxy for nonfatal opioid-related overdoses.

<sup>b</sup>In 2019, data on race/ethnicity was not available for 451 episodes (6.7%). In 2020, race/ethnicity was not available for 379 episodes (4.0%). To align with U. S. Census Bureau definitions of race/ethnicity, episodes identified as more than one race/ethnicity by EMS responders were classified as African American/Black if this category was selected at least once. Next, episodes were classified as Hispanic if this category was selected at least once. Finally, episodes were classified as White if neither African American/Black or Hispanic was selected. In 2019, a total of 74 episodes (1.1%) originally had more than one race/ethnicity designation. In 2020, a total of 61 episodes (0.7%) originally had more than one race/ethnicity designation.

Conceptualization, Methodology, Writing – review & editing. **Zoran Bursac:** Methodology, Writing – review & editing. **Eric F. Wagner:** Conceptualization, Methodology, Writing – review & editing.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Data availability**

The authors do not have permission to share data.

**Acknowledgements**

The authors are grateful to the Florida Department of Health’s Bureau of Emergency Medical Oversight for their assistance. The authors are also grateful to William C. Miller, Professor of Epidemiology at The Ohio State University, for his thoughtful review of an early draft of this article. Preliminary results of this study were presented at the 2022 RCMI Consortium National Conference in March 2022.

Funding: This work was supported by the National Institute on Minority Health and Health Disparities through the Research Center in Minority Institutions at Florida International University [grant number

U54MD012393]; and the National Institute on Drug Abuse [grant number K01DA055820]. The sponsors had no role in study design. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. No financial disclosures were reported by the authors of this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2022.102102>.

## References

- Centers for Disease Control and Prevention. CDC WONDER: Provisional Mortality Statistics, 2018 through Last Month Request. Published May 2022. Accessed May 17, 2022. <https://wonder.cdc.gov/mcd-icd10-provisional.html>.
- Centers for Disease Control and Prevention. DOSE Dashboard: Nonfatal Overdose Data. Accessed May 11, 2022. <https://www.cdc.gov/drugoverdose/nonfatal/dashboard/index.html>.
- Council of State and Territorial Epidemiologists. Recommendations for the Use of Emergency Medical Services Data to Identify Nonfatal Opioid Overdoses. Published May 2022. Accessed August 16, 2022. [https://cdn.ymaws.com/www.cste.org/resource/resmgr/ps/ps2022/Recommendations\\_for\\_EMS\\_NFOO.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/ps/ps2022/Recommendations_for_EMS_NFOO.pdf).
- Council of State and Territorial Epidemiologists. Nonfatal Opioid Overdose Standardized Surveillance Case Definition. Accessed August 16, 2022. [https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-CC-01\\_final\\_7.31.19.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-CC-01_final_7.31.19.pdf).
- Florida Department of Economic Opportunity. Local Area Unemployment Statistics. FloridaJobs.org. Published May 2022. Accessed May 17, 2022. <https://floridajobs.org/workforce-statistics/data-center/statistical-programs/local-area-unemployment-statistics>.
- Florida Department of Health. Prehospital Data Collection and Reporting System. alth.gov/statistics-and-data/prehospital-data-collection-and-reporting-system/index.html. Published April 1, 2021. Accessed August 16, 2022. <https://www.floridahe.com>.
- Florida Emergency Medical Services Advisory Committee, Data Committee, Florida Department of Health, Florida Bureau of Emergency Medical Oversight. EMS Data Standards: Emergency Medical Services Tracking and Reporting System. Accessed May 1, 2022. <https://www.floridaemstars.com/docs/flemstarsdatastandardsvers34.pdf>.
- Hoopsick, R.A., Homish, G.G., Leonard, K.E., 2021. Differences in Opioid Overdose Mortality Rates Among Middle-Aged Adults by Race/Ethnicity and Sex, 1999–2018. *Public Health Rep.* 136 (2), 192. <https://doi.org/10.1177/0033354920968806>.
- National Institute on Drug Abuse. Overdose Death Rates. Published January 20, 2022. Accessed December 20, 2022. <https://nida.nih.gov/research-topics/trends-statistics/overdose-death-rates>.
- Kariisa, M., Davis, N.L., Kumar, S., et al., 2022. Vital signs: drug overdose deaths, by selected sociodemographic and social determinants of health characteristics — 25 states and the district of Columbia, 2019–2020. *MMWR Morb. Mortal. Wkly Rep.* 71 (29), 940–947. <https://doi.org/10.15585/mmwr.mm7129e2>.
- Khoury, D., Preiss, A., Geiger, P., Anwar, M., Conway, K.P., 2021. Increases in naloxone administrations by emergency medical services providers during the COVID-19 pandemic: retrospective time series study. *JMIR Public Health Surveill.* 7 (5), e29298.
- Larochelle, M.R., Slavova, S., Root, E.D., et al., 2021. Disparities in Opioid Overdose Death Trends by Race/Ethnicity, 2018–2019, From the HEALing Communities Study. *Am. J. Public Health* 111 (10), 1851–1854. <https://doi.org/10.2105/ajph.2021.306431>.
- Linás, B.P., Savinkina, A., Barbosa, C., et al., 2021. A clash of epidemics: Impact of the COVID-19 pandemic response on opioid overdose. *J. Subst. Abuse Treat.* 120, 108158 <https://doi.org/10.1016/j.jsat.2020.108158>.
- National Institute on Drug Abuse. Naloxone DrugFacts. Published January 11, 2022. Accessed August 16, 2022. <https://nida.nih.gov/publications/drugfacts/naloxone>.
- Ochalek, T.A., Cumpston, K.L., Wills, B.K., Gal, T.S., Moeller, F.G., 2020. Nonfatal opioid overdoses at an urban emergency department during the COVID-19 pandemic. *J. Am. Med. Assoc.* 324 (16), 1673–1674. <https://doi.org/10.1001/jama.2020.17477>.
- [16] QuickStats: Death Rates for Drug Overdose Among Persons Aged 25–44 Years, by Race and Ethnicity— United States, 2000–2020. *MMWR Morb Mortal Wkly Rep.* 2022;71(46):1485. 10.15585/mmwr.mm7146a4.
- Rodda, L.N., West, K.L., LeSaint, K.T., 2020. Opioid Overdose-Related Emergency Department Visits and Accidental Deaths during the COVID-19 Pandemic. *J. Urban Health* 97 (6), 808–813. <https://doi.org/10.1007/s11524-020-00486-y>.
- Slavova, S., Rock, P., Bush, H.M., Quesinberry, D., Walsh, S.L., 2020. Signal of increased opioid overdose during COVID-19 from emergency medical services data. *Drug Alcohol Depend.* 214, 108176 <https://doi.org/10.1016/j.drugalcdep.2020.108176>.
- Soares, W.E., Melnick, E.R., Nath, B., et al., 2021. Emergency department visits for nonfatal opioid overdose during the COVID-19 pandemic across six us health care systems. *Ann. Emerg. Med.* <https://doi.org/10.1016/j.annemergmed.2021.03.013>.
- Substance Abuse and Mental Health Services Administration. SAMHSA Behavioral Health Treatment Services Locator. Published May 2022. Accessed March 27, 2020. <https://findtreatment.samhsa.gov/locator>.
- [21] Florida Drug Overdose Surveillance and Epidemiology. Non-Fatal Opioid and All Drug Overdose Surveillance Report: Florida, Q4-2019. Published 2019. Accessed August 16, 2022. [https://www.floridahealth.gov/statistics-and-data/fl-dose/\\_documents/non-fatal-od-2019-q4.pdf](https://www.floridahealth.gov/statistics-and-data/fl-dose/_documents/non-fatal-od-2019-q4.pdf).
- U.S. Department of Agriculture Economic Research Service. Rural-Urban Continuum Codes. Published December 10, 2020. Accessed March 1, 2022. <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/>.
- United States Census Bureau. American Community Survey 5-Year Data (2009–2020). Published March 17, 2022. Accessed May 1, 2022. <https://www.census.gov/data/developers/data-sets/acs-5year.html>.
- Volkow, N.D., 2020. Collision of the COVID-19 and addiction epidemics. *Ann. Intern. Med.* 173 (1), 61–62. <https://doi.org/10.7326/M20-1212>.