

# Calls of Despair: An EMS Perspective on Suicide and Overdose in Rhode Island during COVID-19

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## ABSTRACT

In 2020, Americans suffered marked increases in overdose deaths and self-reported suicidal ideation, widely attributed to COVID-19. However, the recent pandemic's full effect on suicide and drug overdose, two of the "deaths of despair", remains poorly understood. This study aims to illustrate the impact of COVID-19 on suicide and overdose calls to emergency medical services (EMS) in Rhode Island using syndromic analysis as a novel public health surveillance tool. Utilizing computer algorithms, suicide and overdose EMS calls were identified during the pre-pandemic (March 2019-February 2020) and pandemic (March 2020-February 2021) years. Versus the prior year, pandemic year mean monthly call volume declined significantly for opioid (-16.2%), overdose (-15.5%), and suicide ideation (-6.2%) syndromes. Given elevated national overdose deaths and suicidality, our results suggest that hesitancy to call 911 amid COVID-19 hampered EMS intervention on suicide and overdose patients, potentially compounding their despair and the acuity of their eventual presentation.

**KEYWORDS:** COVID-19; Drug Overdose; Emergency Medical Services; Public Health Surveillance; Suicide

## INTRODUCTION

In 2020, the average life expectancy in the United States (US) declined 1.8 years,<sup>1</sup> reaching levels not seen since 2003.<sup>2</sup> While much of the decrease is attributed to deaths from SARS-CoV-2 (COVID-19) infection,<sup>1</sup> the repercussions of COVID-19-related psychosocial hardship on US mortality remain poorly understood. Of particular concern is the impact of heightened economic stress, diminished social support networks, and increased isolation on suicide and drug overdose deaths, which together with alcoholic liver disease are often referred to as the "deaths of despair".<sup>3-6</sup>

The impact of COVID-19 on drug overdoses appears to be severe; the United States Centers for Disease Control and Prevention (CDC) reported overdose deaths increased by 31% in 2020 (the first calendar year of the pandemic) compared to 2019.<sup>7</sup> In 2021, overdoses climbed by another 15%.<sup>8</sup> The CDC also found that US suicide deaths declined

by 3% in 2020 compared with 2019,<sup>9</sup> which independent studies have largely corroborated.<sup>10,11</sup> However, a June 2020 national study found that 10.7% of surveyed adults contemplated suicide in the prior 30 days,<sup>6</sup> up 4.3% from 2018.<sup>12</sup> It also found that 13.3% of respondents reported increased substance use to cope with COVID-19 stress.<sup>6</sup>

Data from emergency medical services (EMS) calls for suicide and overdose syndromes (medical emergency classifications based on established criteria) represent a promising tool for public health surveillance of and intervention upon drug use and suicidality. EMS data are available in real time, often within hours of the event, and provide a clear incident location.<sup>13,14</sup> Additionally, they capture patients who receive EMS care but refuse transport, which appears particularly relevant during the COVID-19 pandemic.<sup>15,16</sup>

Local, state, and national US studies found increased EMS calls for drug overdose during the COVID-19 pandemic as compared to corresponding 2019 calendar timeframes.<sup>15,17-20</sup> Similar inquiries of EMS calls for suicide revealed mixed results.<sup>21-25</sup> However, none of these studies examined statewide year-to-year changes in both suicide and overdose call volume across the first 12 months of the COVID-19 pandemic; nor did they parse suicide ideation from suicide attempt to characterize the severity of a suicide-related emergency.

This study aims to characterize the EMS response to acute mental health emergencies in Rhode Island (RI) during the first year of the COVID-19 pandemic by examining changes in statewide 911 calls for drug overdose and suicide. It demonstrates the utility of EMS syndromic analysis as a public health surveillance tool for describing and quantifying these emergencies. Moreover, it 1) identifies potential pandemic-associated demographic changes in suicide and drug overdose risk by age and gender and 2) illuminates possible temporal associations of these behaviors with COVID-19-related stressors.

## METHODS

### Setting

Rhode Island provides a useful setting for the comprehensive study of suicide and drug overdose emergencies during the first year of the COVID-19 pandemic. RI is a diverse state of approximately 1 million people, encompassing urban,

suburban, and rural geography. It is also governed by a single public health department which creates consistency in COVID-19-related gathering restrictions and, to a lesser extent, the availability of social support services. The Center for Emergency Medical Services at the Rhode Island Department of Health (CEMS) is responsible for all EMS protocols and regulatory oversight in the state. CEMS requires all RI EMS agencies to submit standardized patient care data from every call into the Rhode Island Emergency Medical Services Information System (RIEMISIS), facilitating analysis of statewide data.

Rhode Island was among the hardest hit states in the US during both the spring 2020 and early winter 2021 spikes in COVID-19 cases.<sup>26,27</sup> RI has mirrored national overdose trends, setting record high overdose deaths in both 2020 and 2021.<sup>28,29</sup> Suicides in RI declined by 24% from 2019 to 2020.<sup>30</sup> Per 100,000 citizens, the RI overdose death rate climbed from 35.0 in 2019 to 39.6 (13%) in 2020,<sup>28,31</sup> while the suicide death rate decreased from 11.2 in 2019 to 8.6 (-24%) in 2020.<sup>30,31</sup>

### Data Source and Collection

Data were collected using syndromic analysis software by biospatial, Inc. (biospatial, Research Triangle Park, NC). Biospatial harvests data from RIEMISIS, which contains the patient care reports for all EMS calls in the state and adheres to National Emergency Medical Services Information System (NEMSIS) version 3.4.0 standards.<sup>32</sup>

EMS calls were reviewed for two distinct periods: 1) the “pre-pandemic year” (Pre-PY), from March 1, 2019 to February 29, 2020, and 2) “pandemic year 1” (PY1) from March 1, 2020 to February 28, 2021. To capture the maximum number of relevant emergencies, calls were included for the NEMSIS “type of service requested” categories: 911 response (first responding EMS unit), mutual aid (unit responding to emergency outside its primary municipality), and intercept (assisting EMS crew meeting primary unit enroute to hospital).<sup>32</sup> Data were only collected for patients aged 18 and older. All data analyzed in this study were queried from biospatial between January 25, 2022 and March 18, 2022. The Rhode Island Department of Health (RIDOH) Institutional Review Board approved this study in June 2021.

### Syndromic Analysis

Syndromic analysis, a subset of syndromic surveillance, is the use of computer algorithms to process and categorize patient care reports, including both formatted (“click box”) and free text data.<sup>33-35,14</sup> When used in real-time, syndromic analysis allows for public health agencies to monitor upticks and clusters of disease in a community.<sup>33,34,14</sup> Past studies have applied it to EMS and ED data as a tool for overdose surveillance, where patient care reports and billing data were analyzed and classified into drug-related “syndromes”, or categories based on the nature of a call’s emergency.<sup>13,14,35-37</sup>

For this study, the syndromic analysis drew upon ICD-10 billing codes and patient care report fields, including

chief complaint, provider impression, provider narrative, and medications administered. Calls fitting the following syndromes were analyzed for this study: suicide ideation, suicide attempt, opioid, and overdose. Suicide ideation encompasses all suicide-related emergencies, while suicide attempt applies only to suicide emergencies where the patient undertook an attempt. The opioid and overdose definitions were based on the RIDOH-enhanced state opioid surveillance EMS case definitions.<sup>38,13</sup> The opioid syndrome captures opioid-specific drug emergencies, while the overdose syndrome encompasses all drug-related 911 emergency calls.<sup>38</sup> Both definitions exclude therapeutic uses of opioids, such as treatment of EMS patient pain.<sup>38</sup>

### Data Analysis

Following syndromic classification, data were exported into a spreadsheet for further analysis. For all four syndromes, Pre-PY to PY1 changes were analyzed in total, by season, as well as for patient gender identity (“gender”) and age. Seasons were defined: spring = March-May, summer = June-August, fall = September-November, and winter = December-February. Due to limitations of NEMSIS v3.4.0,<sup>32</sup> gender was categorized as male and female. Ages were grouped 18–29, 30–39, 40–49, 50–59, and 60+.

For each syndrome, Pre-PY and PY1 call volumes were compared for absolute and percent change. The incident rate for each syndrome was calculated by dividing syndromic totals by the total RI EMS call volume for the same period. 95% confidence intervals were calculated based on Pre-PY to PY1 monthly percent change values, and thus, all year to year percent changes analyzed for significance were expressed as the mean of the Pre-PY to PY1 percent changes for the 12 respective months (“mean monthly percent change”). Seasonal mean monthly percent changes reflect a 3-month mean of Pre-PY to PY1 percent changes. P-values were also calculated using a paired t-test comparing monthly totals between the two study periods. Male and female Pre-PY to PY1 monthly percent change datasets were compared to ascertain if the year to year changes were significantly different between genders.

### Syndromic Validation

There are few validation studies examining syndromic classification of suicide and overdose EMS calls.<sup>13,14</sup> Thus, a validation sub-study of five calls from each month between March 1, 2019 and February 28, 2021 (N=120 calls) was performed. Calls were selected from RIEMISIS using a random number generator, and both 911 and nonemergent calls were included. All 120 selected EMS reports were read in their entirety by one author (JLT) and judged whether they fit within biospatial and RIDOH syndromic definitions for suicide ideation, suicide attempt, opioid, and overdose. These assessments were then compared with the biospatial syndromic classifications for the same calls. Validation data were queried from RIEMISIS and biospatial between October 27 and November 23, 2021.

Using the investigator review as a standard, the sub-study yielded sensitivity and specificity values of 1 for the biospatial opioid, overdose, and suicide ideation syndromes. The suicide attempt syndrome had a sensitivity of 1 and a specificity of 0.99 (Table 1).

**Table 1.** Validation of biospatial, Inc., syndromic algorithms\*

	Opioid	Overdose	Suicide ideation	Suicide attempt
True Positive	1	1	6	2
True Negative	119	119	114	117
False Positive	0	0	0	1
False Negative	0	0	0	0

\*Investigator review of EMS patient care report used as standard

**Table 2.** RI Pre-PY (March 2019–February 2020) and PY1 (March 2020–February 2021) EMS call volume with mean monthly % change\*

Syndrome	Pre-PY	PY1	Mean Monthly % Change	95% CI
Opioid	1780	1473	– 16.2%	[– 24.9%, – 7.6%]
Overdose	2642	2221	– 15.5%	[– 22.0%, – 9.2%]
Suicide Ideation	5318	4987	– 6.2%	[– 10.5%, – 1.9%]
Suicide Attempt	1783	1739	– 1.9%	[– 8.6%, 4.9%]

\*mean monthly % change is calculated as the mean of Pre-PY to PY1 % changes for 12 respective months

## RESULTS

### Drug-related Emergencies

From Pre-PY to PY1, opioid and overdose absolute EMS call volume declined significantly by 307 (16.2%) and 421 (15.5%) calls, respectively (Table 2). The corresponding declines in the incident rates were insignificant. Both opioid and overdose call volumes decreased significantly and by over 20% in the fall of PY1. Overdose call volume also declined significantly in the winter of PY1, by 86 (14.5%) calls (Table 3a).

Opioid and overdose calls declined significantly for both females and males, but these declines were not statistically different from one another. Opioid and overdose call volume also declined for all age groups, to the greatest extent in ages 18–29 (Figure 1).

### Suicide Emergencies

PY1 suicide ideation calls significantly decreased by 331 (6.2%) from Pre-PY, and suicide attempt calls did not significantly change between the study years (Table 2). The incident rates remained largely unchanged for either syndrome. The largest, and only statistically significant, seasonal decline in suicide ideation calls was by 232 (10.1%) calls in the PY1 spring. Seasonal suicide attempt call totals were essentially unchanged in PY1 (Table 3b).

There was not a significant difference in the year to year trends of male versus female suicide ideation and suicide attempt call totals. Suicide ideation and attempt calls decreased in patients aged under 40, but they increased in ages over 50. Notably, suicide attempt calls increased by 20% in ages 60 and older (Figure 2).

**Table 3a.** RI seasonal opioid and overdose EMS call volume for Pre-PY and PY1 with mean monthly % change

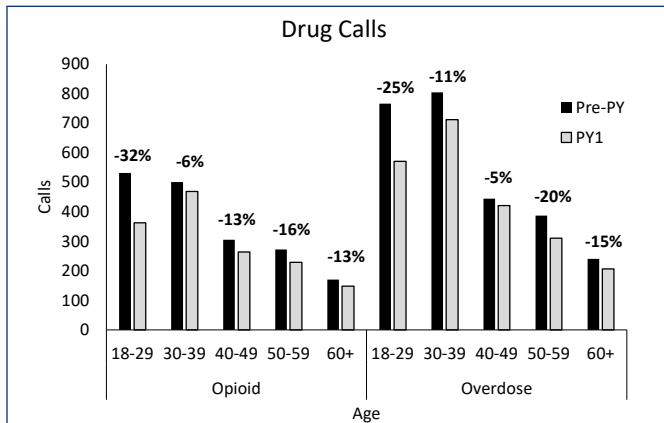
Season*	Opioid				Overdose			
	Pre-PY	PY1	Mean Monthly % Change	95% CI	Pre-PY	PY1	Mean Monthly % Change	95% CI
Spring	450	351	–20.6%	[–58.3%, 17.1%]	665	527	–19.8%	[–54.4%, 14.8%]
Summer	515	461	–8.1%	[–43.8%, 27.6%]	753	689	–7.2%	[–36.0%, 21.7%]
Fall	436	325	–25.5%	[–38.5%, –12.5%]	640	507	–20.8%	[–31.6%, –10.1%]
Winter	379	336	– 0.8%	[–50.0%, 28.4%]	584	498	–14.5%	[–28.2%, –0.9%]

\*seasons defined: spring = March–May, summer = June–August, fall = September–November, and winter = December–February

**Table 3b.** RI seasonal suicide ideation and suicide attempt EMS call volume for Pre-PY and PY1 with mean monthly % change

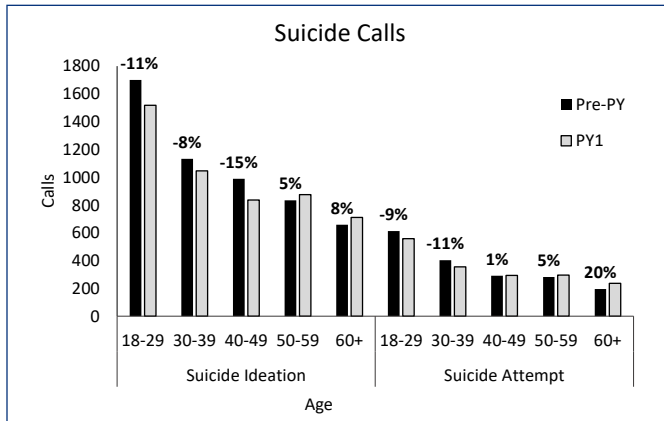
Season	Suicide Ideation				Suicide Attempt			
	Pre-PY	PY1	Mean Monthly % Change	95% CI	Pre-PY	PY1	Mean Monthly % Change	95% CI
Spring	1307	1175	–10.1	[–13.1%, –7.1%]	396	397	1.1%	[–33.2%, 35.4%]
Summer	1352	1279	–5.0	[–27.2%, 17.2%]	462	462	0.3%	[–30.3%, 30.8%]
Fall	1349	1324	–1.8	[–14.4, 10.8%]	504	464	–7.8%	[–32.6%, 16.9%]
Winter	1310	1209	–7.7	[–30.8%, 15.4%]	421	416	–0.9%	[–27.4%, 25.6%]

**Figure 1.** RI EMS Pre-PY and PY1 call volume for opioid and overdose syndromes by age\*



\*year to year % change in total call volume listed above its respective age group

**Figure 2.** RI EMS Pre-PY and PY1 call volume for suicide ideation and suicide attempt syndromes by age\*



\*year to year % change in total call volume listed above its respective age group

**DISCUSSION**

Our results indicate that EMS calls for suicide and overdose largely decreased in RI during the first 12 months of the COVID-19 pandemic. However, the PY1 decline in overdose call volume of 16% is contradicted by a 2019 to 2020 increase in official statewide overdose deaths of 13%.<sup>28</sup> The RI suicide death rate declined to a much greater extent (-24%) in 2020 than PY1 suicide ideation calls (-6%) or suicide attempt calls, which did not significantly change.<sup>30</sup>

Nationally, our findings are contrary to record overdose deaths and increased self-reported suicidality during the first year of the COVID-19 pandemic.<sup>6,7,39</sup> These discrepancies suggests that there may have been a prevailing hesitancy or inability to call 911 – likely due to fear of COVID-19 infection, creating a barrier to EMS intervention on mental health crises.

One interpretation of contrasting overdose 911 call and death data is that the severity of drug emergencies in RI

increased. Overdose calls declined the most in ages 18–29, indicating that gathering restrictions may have dampened “social” drug use among young partygoers.<sup>40</sup> A smaller population, including older demographics, may have experienced increased substance use to cope with heightened psychosocial stressors.<sup>6,39</sup> COVID-19-associated hesitancy to call 911 may have prevented this group from receiving early EMS intervention, further compounding their despair and leading to more acute overdose presentations. The conflict between RI EMS overdose call volume and the existing EMS literature during COVID-19 could be attributed to regional heterogeneity.<sup>15,17-20,41</sup> Nonetheless, our findings are consistent with their call for improved overdose surveillance and substance-use intervention.

Despite decreased RI suicide ideation calls, calls for suicide attempt remain unchanged, reflecting an increase in the proportion of suicidal patients acting on their ideations. In the face of increased self-reported suicidal thoughts,<sup>6,39</sup> this raises concern that many suicidal patients may have received delayed or no emergency intervention during COVID-19. While 2020 national and RI data indicate declining suicide deaths,<sup>9,30</sup> improved intervention upon actively suicidal patients by EMS and other providers requires further examination and resources, as the mental health of Americans remains a serious concern.

Spring 2020 was the only PY1 quarter where suicide ideation calls significantly declined. In addition to fear of contagion, this could have occurred due to an initial pulling-together or “honeymoon” effect where suicidal behavior drops in the immediate aftermath of a disaster due to a shared purpose.<sup>42,43,11</sup> This phenomenon has been documented in various disaster circumstances (including COVID-19),<sup>42-44,11</sup> and it can precede a delayed increase in suicidality due to subsequent disillusionment.<sup>42</sup> Thus, it is plausible that the shared purpose of flattening the COVID-19 curve contributed to both spring 2020 and total PY1 decreases in suicide ideation calls and suicide deaths. Additionally, increased PY1 suicide calls in patients over 50 may have resulted from increased isolation in this population due to social distancing.<sup>45-47</sup>

EMS syndromic analysis has the potential to quantify the population burden, recognize macroscopic precipitating stressors, and identify demographics at elevated risk of deaths of despair. Utilized by public health agencies, it could illuminate clusters of overdose and suicide calls in real-time and guide the dispatching of pertinent resources, such as bystander training initiatives, naloxone kits, and mental health professionals.

**LIMITATIONS**

Syndromic analysis of EMS documentation is a new method that requires further validation. While EMS calls were used as a proxy for suicidality and drug use within a population,



many confounding factors could have led to discrepancies in 911 volume and population-wide behavior. For demographic analysis, gender minorities and race/ethnicity were not analyzed due to limitations in RIEMIS. Patients under age 18 were also excluded from the study. Last, COVID-19 cases, support services, and gathering restrictions differed by state during the study period. Trends in suicide and substance use may also vary regionally. Thus, as RI is a small state in the Northeast, our results may not be generalizable to other areas of the US.

## CONCLUSION

This study found the incidence of EMS calls for drug overdose and suicide to largely decline during the first 12 months of the COVID-19 pandemic in RI – a period when national overdose deaths and self-reported suicidality markedly increased. In this context, our results suggest a widespread hesitancy of those in acute despair to seek and receive EMS intervention. Thus, COVID-19-associated barriers to EMS care may have increased the severity of suicide and drug use emergencies, indicating a heightened need for effective prevention, surveillance, and targeted outreach to at-risk communities.

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