



Adolescent health brief

Adolescent US Poison Center Exposure Calls During the COVID-19 Pandemic

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A B S T R A C T

Purpose: The objective of this study was to evaluate trends and characteristics in adolescent poison center (PC) exposure calls before and during the COVID-19 pandemic.

Methods: A retrospective review of PC calls for adolescents aged 13–17 years from January 1, 2018 through June 30, 2021.

Results: During the pandemic, US PCs had a higher proportion of adolescent exposure calls managed in a healthcare facility (71.9% vs. 67.4%) and hospital admissions (27.2% vs. 25.7%) than prior to the pandemic. There was a higher proportion with suicide intent (55.8% vs. 48.8%), moderate/major clinical effects (22.8% vs. 20.1%), and deaths (0.07% vs. 0.05%). Monthly calls significantly increased from 30 calls/month to 204 calls/month ($p < .001$). The slope of hospital admissions significantly increased (0.19% per month, $p < .001$) during the pandemic.

Discussion: During the COVID-19 pandemic, US PCs observed an increase in adolescent suicidal intent exposure calls with more severe outcomes, hospitalizations, and deaths.

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IMPLICATIONS AND CONTRIBUTION

These findings add to the growing literature of how the COVID-19 pandemic has significantly impacted the mental and physical health of the adolescent population. As surges in the pandemic continue to occur and the behavioral health crisis continues, healthcare providers and public health officials will need to continue to provide resources to overcome these challenges.

Prior to the COVID-19 pandemic, rates of US high school students experiencing sadness increased from 26% to 37% from 2009 to 2019 [1]. Suicide thoughts, planning, and attempts also increased [1]. The pandemic exacerbated mental health concerns because adolescent suicide attempts and ideation presenting to Pediatric Emergency Departments increased during the pandemic [2]. US poison centers (PCs) observed an increase in the proportion of adolescent calls compared with other pediatric

age groups during the pandemic [3]. These observations have led to multiple organizations declaring an adolescent mental health crisis in 2021 [4]. With varying vaccination rates and spread of emerging strains, the threat of another pandemic surge remains. The objective of this study was to evaluate trends in characteristics of adolescent PC exposure calls before and during the COVID-19 pandemic.

Methods

This was a retrospective review of US PC exposure calls from January 1, 2018 through June 30, 2021. Aggregate call data were accessed through the American Association of Poison Control Centers National Poison Data System (NPDS) for

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Table 1
Annual adolescent exposures calls to US poison centers by category

	2018 (N = 169,189)		2019 (N = 171,187)		2020 (N = 168,768)		2021 (N = 98,694)*	Total (N = 607,838)
	January–June (N = 86,024)	July–December (N = 83,165)	January–June (N = 86,671)	July–December (N = 84,516)	January–June (N = 82,090)	July–December (N = 86,678)	January–June (N = 98,694)	
OTC Analgesic	16,827 (19.6%)	16,495 (19.8%)	17,460 (20.1%)	15,979 (18.9%)	16,241 (19.8%)	19,017 (21.9%)	23,388 (23.7%)	125,407 (20.6%)
Prescription Mood Stabilizer	14,428 (16.8%)	14,375 (17.3%)	14,934 (17.2%)	14,162 (16.8%)	14,599 (17.8%)	15,924 (18.4%)	18,862 (19.1%)	107,284 (17.7%)
Prescription Pharmaceutical	13,469 (15.7%)	12,473 (15.0%)	12,682 (14.6%)	12,395 (14.7%)	11,632 (14.2%)	11,768 (13.6%)	13,232 (13.4%)	87,651 (14.4%)
Household Product	13,356 (15.5%)	12,446 (15.0%)	12,930 (14.9%)	13,480 (15.9%)	12,108 (14.7%)	11,455 (13.2%)	11,691 (11.8%)	87,466 (14.4%)
OTC Pharmaceutical	12,877 (15.0%)	11,944 (14.4%)	13,189 (15.2%)	12,359 (14.6%)	12,399 (15.1%)	13,264 (15.3%)	15,452 (15.7%)	91,484 (15.1%)
Other	4,214 (4.9%)	4,335 (5.2%)	4,644 (5.4%)	4,794 (5.7%)	4,119 (5.0%)	4,073 (4.7%)	4,382 (4.4%)	30,561 (5.0%)
Stimulant	3,363 (3.9%)	3,225 (3.9%)	3,369 (3.9%)	3,247 (3.8%)	3,314 (4.0%)	3,181 (3.7%)	3,607 (3.7%)	23,306 (3.8%)
Prescription Opioid	1,811 (2.1%)	1,679 (2.0%)	1,550 (1.8%)	1,434 (1.7%)	1,448 (1.8%)	1,459 (1.7%)	1,524 (1.5%)	10,905 (1.8%)
Ethanol	1,290 (1.5%)	1,318 (1.6%)	1,252 (1.4%)	1,416 (1.7%)	1,473 (1.8%)	1,449 (1.7%)	1,417 (1.4%)	9,615 (1.6%)
Heavy Metal	1,285 (1.5%)	1,162 (1.4%)	1,187 (1.4%)	1,212 (1.4%)	1,093 (1.3%)	1,067 (1.2%)	1,298 (1.3%)	8,304 (1.4%)
Marijuana	1,051 (1.2%)	1,188 (1.4%)	1,312 (1.5%)	1,438 (1.7%)	1,463 (1.7%)	1,450 (1.7%)	1,717 (1.7%)	9,619 (1.6%)
Bite or Sting	924 (1.1%)	1,336 (1.6%)	899 (1.0%)	1,297 (1.5%)	975 (1.2%)	1,200 (1.4%)	781 (0.8%)	7,412 (1.2%)
Gas, Fumes, Vapors	777 (0.9%)	808 (1.0%)	795 (0.9%)	888 (1.1%)	721 (0.9%)	815 (0.9%)	864 (0.9%)	5,668 (0.9%)
Hallucinogens	309 (0.4%)	334 (0.4%)	424 (0.5%)	363 (0.4%)	405 (0.5%)	477 (0.6%)	371 (0.4%)	2,683 (0.4%)
Illicit Opioids	43 (0%)	47 (0.1%)	44 (0.1%)	52 (0.1%)	100 (0.1%)	79 (0.1%)	108 (0.1%)	473 (0.1%)

OTC = Over-the-counter.

* 2021 includes the 6-month period from January through June.

closed case exposures involving patients aged 13–17 years. Demographics, category of substance of exposure, management/call site, intent, and medical outcome as defined by NPDS were obtained [5]. Descriptive data were used including medians and interquartile ranges for non-normally distributed continuous variables. The average for the prepandemic years (2018–2019) and average during the COVID-19 pandemic (2020 through June 2021) were compared using Chi-squared test. Monthly calls, hospital admission rate, and severe outcome rate (moderate/major effects or death) were evaluated using interrupted time series with segmented regression analysis. Due to autocorrelation, we modeled the data using the AUTOREG (AUTOREG is the procedure used in SAS, it estimates and forecasts linear regression models for time series data when the errors are autocorrelated or heteroscedastic) function in SAS with the maximum likelihood modeling option. In our monthly models, we specified NLAG = 13 and used backward elimination to retain autoregressive parameters significant at the 0.05 level. Predicted values for the monthly adolescent calls, hospital admission rate, and severe outcome rate were calculated from the segmented regression models to illustrate linear trends over time. Statistical analyses were performed in SAS (version 9.4, Cary, North Carolina). This project was approved as exempt by the Colorado Institutional Review Board.

Results

For adolescents aged 13–17 years, the average annual US PC exposure calls for 2018 and 2019 was 125,640 per year and from January 1, 2020 through June 30, 2021 there was an average of 130,293 calls per year. PCs had a higher proportion of calls managed in a healthcare facility (93,706; 71.9% vs. 84,638; 67.4%, $p < .001$) and a higher proportion requiring hospital admission (25,507; 27.2% vs. 21,743; 25.7%, $p < .001$) during the pandemic compared to the prior 2 years. During the pandemic, there was also a higher proportion of moderate/major clinical effects (27,945; 22.8% vs. 23,932; 20.1%, $p < .001$). In addition, there was a 44% increase in the

average number of deaths (61–88). Intentional exposure with a suicide intent was also higher during the pandemic (72,650; 55.8% vs. 61,343; 48.8%, $p < .001$). There were more exposures to over-the-counter medications and mood stabilizers and a decrease in prescription pharmaceuticals and household products (Table 1). Illicit opioid exposures almost doubled from a mean of 93 (0.07%) in 2018/2019 to 191 (0.05%) in 2020/2021.

When the COVID-19 pandemic started in March 2020, a segmented regression analysis shows monthly exposure calls immediately decreased by 1,870 calls ($p < .001$). However, the subsequent trend in calls during the pandemic increased compared to prior to the pandemic from 30 calls per month to 204 calls per month ($p < .001$) (Figure 1A). The hospital admission rate immediately increased by 1.05% ($p < .001$) in March 2020 and there was a change in the trend in hospital admissions during the pandemic compared to before ($p < .001$) with the slope prior to the pandemic nearly flat (0.03% decrease) compared to a 0.19% increase per month during the pandemic (Figure 1B). Finally, severe outcomes immediately increased by 1.12% in March 2020 ($p < .001$), but the overall slope of severe outcomes per month before and after the start of the pandemic was similar (Figure 1C).

Discussion

We observed a statistically significant drop in calls to PCs in the beginning of the pandemic. However, the rate of calls per month significantly increased thereafter compared to the rate of calls per month in the years prior to the pandemic. We observed an overall significant increase in the proportion of suicidal intent, hospitalizations, and severe outcomes. Overall overdose deaths in the United States surpassed 100,000 in 2021, with the majority due to opioids and the fentanyl crisis [6]. This impact on adolescents was also reflected in our cohort, with a 44% increase in the number of deaths and opioid exposure calls doubling in 2020 and 2021 compared with previous years.

Initial declines in overall calls early in the pandemic may have been due to supervision at home due to school closures and work restrictions. However, as the year progressed, increases in

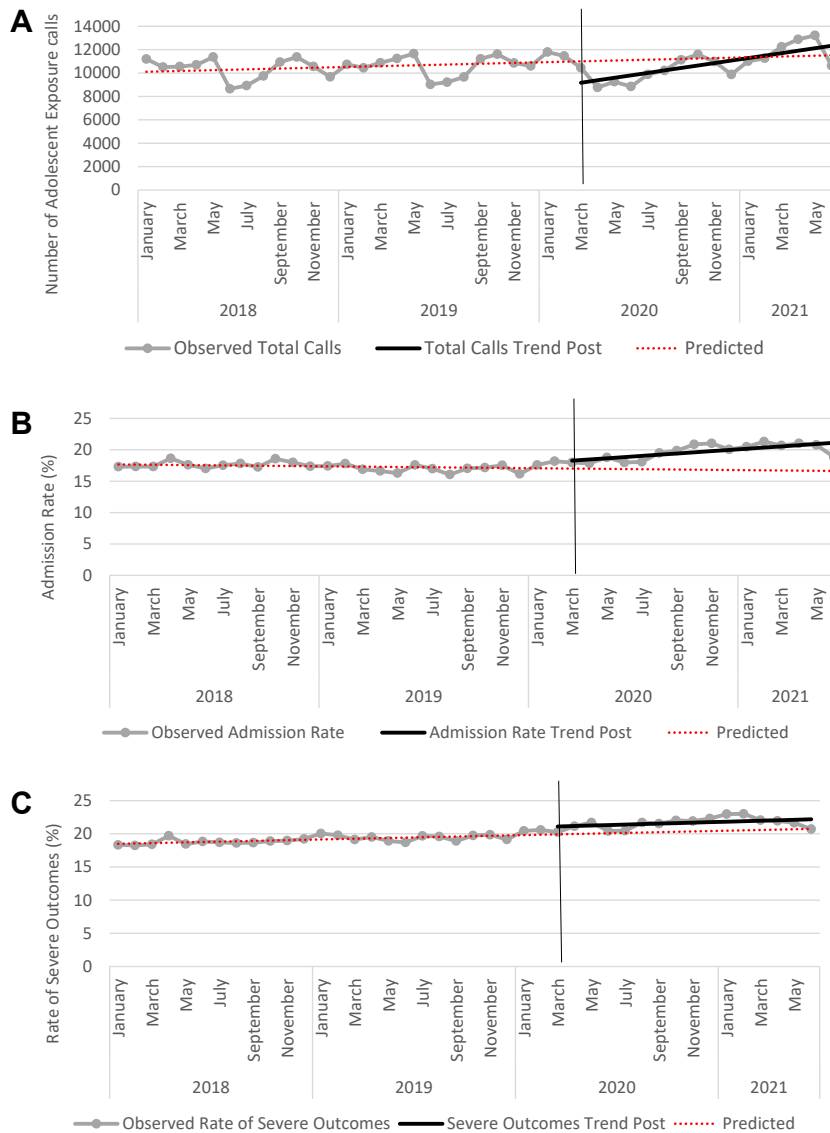


Figure 1. (A) Monthly adolescent exposure calls reported to NPDS, January 2018 through June 2021. (B) Monthly admission rate for adolescent exposure calls reported to NPDS, January 2018 through June 2021. (C) Rate of monthly adolescent exposure calls with severe outcomes (moderate or major effects or death) reported to NPDS, 2018 through June 2021.

academic, social, and family stressors may have led to worsening or exacerbating mental health symptoms and ultimately an increase in suicidal attempts. This also may be reflected in the product that was ingested, which mostly was over-the-counter analgesics (common and easily assessable at home) and prescription mood stabilizers (pre-existing mental health disorders). Recent evidence demonstrated suicide risk increased from April to June in 2020 [7]. These findings are clinically meaningful as well; these patients require significant resources and space within emergency departments while awaiting their mental health evaluations and dispositions.

There are some limitations to PC data. Mostly, it is limited to self-reporting by the public and healthcare providers. Thus, NPDS is likely an underestimation of the true number of exposures. This is demonstrated by the discrepancies of overall CDC-reported overdose deaths compared with overall deaths reported

to NPDS. In some exposure calls, not all clinical effects are followed.

These findings add to the growing literature of how the COVID-19 pandemic has significantly impacted the mental and physical health of the adolescent population. As surges in the pandemic continue to occur and the behavioral health crisis continues, healthcare providers and public health officials will need to continue to develop solutions and resources to overcome these challenges.

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