



ORIGINAL CONTRIBUTION

Despair in the time of COVID: A look at suicidal ingestions reported to the California Poison Control System during the pandemic

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Abstract

Background: Despite concern that the global pandemic will worsen depression and suicide rates, there remain little data on its actual effect. The purpose of this study was to determine the effect of the COVID-19 pandemic on suicidal ingestions reported to the California Poison Control System (CPCS).

Methods: This was a cross-sectional comparison of suicidal ingestions reported to the CPCS during the 2020 COVID-19 pandemic compared to suicidal ingestions reported during the same period in 2018 and 2019.

Results: The CPCS received 19,607 call for suicidal ingestions during the study periods, of which 13,800 were in the pre-COVID era (2018 and 2019) and 5,807 were in the COVID era. The median (IQR) number of suicidal ingestions per month decreased from 2,286 (2,240–2,364) to 1,940 (1,855–2,045; $p = 0.02$). This decrease was consistent and significant across all age groups except those age 70 or older. Ingestions without adverse events decreased by 101 cases/month (95% confidence interval [CI] = 136.8 to 65; $p = 0.0003$), minor outcomes decreased by 156.6 cases/month (95% CI = 226.2 to 87.1; $p = 0.001$), and moderate outcomes decreased by 96 cases/month (95% CI = 143.9 to 48.1; $p = 0.00021$). Major outcomes decreased from 793 (4.99%) cases in the pre-COVID era to 315 (4.60%) cases in the COVID era (risk ratio = 0.92, 95% CI = 0.81 to 1.05). The number of deaths decreased by 3.7 cases/month (95% CI = -8.3 to 0.92, $p = 0.10$).

Conclusions: Despite concern for worsening suicidality, calls regarding suicidal ingestions to the nation's largest poison control center decreased during the COVID era compared to the pre-COVID era. This study provides evidence that the pandemic's effects on modern society remain difficult to predict. Further effort is needed to understand how pandemic will affect American's mental health.

INTRODUCTION

Background

The novel SARS-CoV-2 coronavirus and its disease, COVID-19, have upset all facets of American life and placed an unprecedented strain on the health care system. Although coordinated efforts such as social distancing are necessary to reduce mortality, those with psychiatric disease or substance abuse disorders may be particularly vulnerable to worsening symptoms and drug overdose. In 2018, suicide claimed the lives of 48,344 Americans. Over the past 20 years, suicide rates have increased 35%, making it the second highest cause of death for Americans aged 10 to 24 and the 10th highest cause of death for Americans overall.^{1,2}

As the United States grapples with the loss of 22 million jobs and containment of the SARS-CoV-2 virus, there has been substantial concern that tightening social restrictions will further increase depression and suicide. High-ranking government officials fear the potential political and economic fallout of continued mitigation efforts and have predicted an increase in depression and suicide if quarantine measures remain in place.

Importance

Physicians have also raised concerns over the risk of worsening depression and suicide due to continued social isolation,^{3,4} yet there remains a paucity of concrete data on the actual effect of the COVID-19 pandemic on suicide rates in the United States. Most of the available data only examine potential risk factors for worsening depression or predict potential suicide rates based on numbers seen during prior economic recessions.^{5,6} Surveys conducted by the Centers for Disease Control and Prevention (CDC) indicate worsening depression and anxiety among Americans during the pandemic but rely on self-reported symptoms and not actual rates of suicide attempts or related fatalities.⁷⁻⁹

Goals of this investigation

To provide objective data on the effects of quarantine and the COVID-19 pandemic on suicide rates in California, we conducted a retrospective review of data from the California Poison Control System (CPCS) to identify the number of calls for suicidal ingestion.

METHODS

Study design and setting

The CPCS is the largest poison control system in the United States. It serves a population of approximately 40 million people (roughly 1/10th of the U.S. population) and receives over 330,000 calls

annually. It serves as the primary source for treatment recommendations after poison exposures for residents and health care providers. All calls are received by trained poison center specialists and documented in an electronic database (Visual Dotlab Enterprise). For every case, patient demographics and details regarding the type, timing, and quantity of drug exposure are captured and standardized codes for signs, symptoms, treatment, and ultimate management are recorded. In addition, a time-stamped, free-text section allowed the poison control specialist to further document ongoing details regarding case progression. This study was exempt from institutional review due to the retrospective nature and deidentification of subjects.

Selection of participants

We selected calls involving suicide attempts during the period of January 1 to May 30 for the years 2018 to 2020. The year 2020 was designated the "COVID-19 quarantine period." Data were extracted from the CPCS database and exported into Microsoft Excel. Data extracted included: exposure site, caller location, sex, age, and outcome severity.

Demographics

Exposure site and caller location were each classified as occurring at/from one of nine possible locations: patient's home, another's home, workplace, health care facility, school, restaurant, public space, other, or unknown.

Outcomes

Outcomes were classified as no effect, minor effect, moderate effect, major effect, or death (Table 1). Call data from the year 2020 were then compared to call data during the years 2018 and 2019.

Data analysis

The data were analyzed using "month" as the unit of analysis. The definition of pre-COVID era is March, April, and May 2018 and 2019. The COVID era is defined as March, April, and May 2020. Pediatric patients were defined by age <18 years. Age was analyzed both as an ordinal and nonordinal group, in which the age grouping was 12–17, 18–29, 30–49, 50–69, and 70 y and above. Shapiro-Wilk testing was used to assess normality. Continuous data that were normally distributed were expressed as means with standard deviations (SDs), along with 95% confidence intervals (CIs) for the mean. Nonnormal continuous data were expressed as medians with interquartile ranges (IQRs). Categorical variables were reported as proportions, with binomial exact 95% CIs. There were insufficient number of

ingestions to analyze trends of ingestions of specific agents, such as hydroxychloroquine. Comparisons between two continuous variables were performed with nonparametric Wilcoxon rank-sum test. Categorical variables were compared with chi-square or Fisher's exact test, as appropriate.

RESULTS

Characteristics of study subjects

During the study period (March–May 2018–2020), there were a total of 19,607 cases involving reported suicidal ingestions. These cases included 13,800 in the pre-COVID era, compared with 5,807 in the COVID era. The median (IQR) number of cases per month in the pre-COVID era was 2,286 (2,240–2,364), compared with 1,940 (1,855–2,045) in the COVID era, respectively ($p = 0.02$; Figure 1). Females accounted for 64% of cases in the pre-COVID era, compared with

63% in the COVID era. There was no change in the age or sex distribution between the pre-COVID and COVID eras.

Main results

Overall, there was a significant decline in the median number of monthly calls regarding suicidal ingestions (2,286 pre-COVID era vs. 1,940 in the COVID era, $p = 0.02$). This effect was observed across all age groups, except those age 70 and older (Table 2).

The number of suicidal ingestions in patients without adverse events decreased by 101 cases per month from the pre-COVID era (412 cases/month) to the COVID era (311 cases/month; $p = 0.0003$, 95% CI = -136.8 to -65). Similarly, the number of suicidal ingestions in patients with minor outcomes also decreased significantly from the pre-COVID era (695.3/month) to the COVID era (538.7/month); ($p = 0.001$, 95% CI = -226.2 to -87.1). The number of suicidal ingestions in patients with moderate outcomes decreased significantly

TABLE 1 AAPCC outcome definitions

AAPCC coding	Definition
No effect	The patient did not develop any signs or symptoms as a result of the exposure.
Minor effect	The patient developed some signs or symptoms as a result of the exposure, but they were minimally bothersome and generally resolved rapidly with no residual disability or disfigurement. A minor effect is often limited to the skin or mucus membranes (e.g., self-limited gastrointestinal symptoms, drowsiness, skin irritation, first-degree dermal burn, sinus tachycardia without hypotension, and transient cough).
Moderate effect	The patient exhibited signs or symptoms as a result of the exposure that were more pronounced, more prolonged, or more systemic in nature than minor symptoms. Usually, some form of treatment is indicated. Symptoms were not life-threatening, and the patient had no residual disability or disfigurement (e.g., corneal abrasion, acid–base disturbance, high fever, disorientation, hypotension that is rapidly responsive to treatment, and isolated brief seizures that respond readily to treatment).
Major effect	The patient exhibited signs or symptoms as a result of the exposure that were life-threatening or resulted in significant residual disability or disfigurement (e.g., repeated seizures or status epilepticus, respiratory compromise requiring intubation, ventricular tachycardia with hypotension, cardiac or respiratory arrest, esophageal stricture, and disseminated intravascular coagulation).
Death	The patient died as a result of the exposure or as a direct complication of the exposures.

Abbreviations: AAPCC, American Association of Poison Control Centers.

CASE DISTRIBUTION PER MONTH

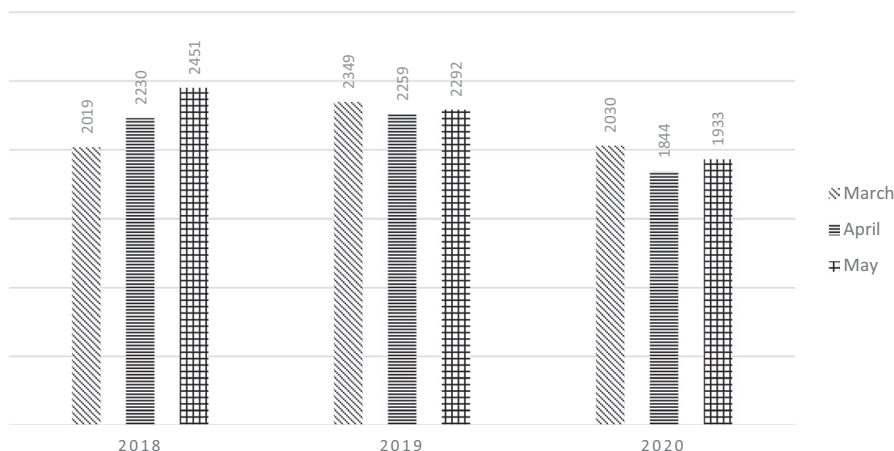


FIGURE 1 Total number of cases per month

TABLE 2 Change in suicidal ingestion cases stratified by age

Age group	Pre-COVID era	COVID era	p-value	95% CI
12–17 y	535	460	0.0047	–118.3 to –31.4
18–29 y	712.3	604.7	0.0008	–153.0 to –62.3
30–49 y	600.7	491.7	0.0025	–165 to –52.9
50–69 y	356	278	0.009	–128.4 to –26.2
70+ y	56.3	51.7	0.29	–14.4 to 5.04
Age not recorded	39	48	0.099	–2.2 to 20.5

Note: Pre-COVID era: mean of 2018 and 2019 calls.

from 482 cases/month in the pre-COVID era to 386 cases/month during the COVID era ($p = 0.00021$, 95% CI = –143.9 to –48.1). Major outcomes accounted for 793 cases (4.99% of all cases) in the pre-COVID era and 315 cases (4.60%) during the COVID era (risk ratio = 0.92, 95% CI = 0.81 to 1.05). The number of deaths decreased by 3.7 cases/month (95% CI = –8.3 to 0.92, $p = 0.10$) in the COVID era versus the pre-COVID era.

Exposures almost exclusively occurred at home during both the pre-COVID and the COVID eras (>99% of calls during both periods). The majority of calls originated from health care facilities during both the pre-COVID and the COVID eras (89.1% vs. 86.3%). Calls coded as coming from home and from “other location” during the pre-COVID and COVID eras were 7.55% versus 10.33% and 2.93% versus 3.15%, respectively. The remaining locations cumulatively made up < 1% of call locations during both periods.

DISCUSSION

The mental health risk of COVID-19 and its containment measures is a valid and ongoing concern. The fear of disease, ill family members, lockdowns, social distancing, and school closures have all heavily impacted the lives of Americans. Previous attempts to predict the effect of global pandemic on Americans’ mental health almost universally warn of rising anxiety, depression, and suicidality.^{3,4} Limited data from surveys conducted by the CDC also show rising rates of anxiety and depressive symptoms compared to the same period in 2019.^{7,8} A follow-up CDC survey by Czeisler et al.⁹ confirmed these findings and identified an increase in suicidal ideation and substance abuse in June 2020. Specific populations at increased risk were Hispanic Americans, Black Americans, unpaid adult caregivers, and essential workers.

Nonetheless, in this study, which took place through the CPCS, the nation’s largest poison control system, we found a decrease in the incidence of calls related to suicidal ingestions. This trend showed a decrease in calls across all age groups and there was no significant change in the proportion of patients with serious outcomes. There are several potential differences between our findings and the results of the study by Czeisler et al. First, we report suicide attempts and not simply suicidal ideation. It is possible Americans are experiencing increased rates of depression, but not to the point of actually attempting suicide. Second, the study by Czeisler et al.

was performed the month after our study concluded and may represent increasing depression with greater time spent living with pandemic. Third, our study included calls to the CPCH and it is possible that the rates of depression or suicidal ideation are not the same throughout the country.

Our results differ from the widespread belief that the psychological strain of COVID-19 containment measures will lead to worsening suicide rates among the American public. Our findings also contrast with some predictions of higher suicide rates based on observations from previous economic recessions or based on the potential for worsening risk factors for depression,^{5,6} yet the effects of the COVID-19 pandemic are unprecedented in modern history. Comparisons made with isolated economic hardship or even isolated natural disasters cannot compare to the enormity of a global pandemic that has so thoroughly and abruptly upended the financial, social, and spiritual well-being of all individuals. It is possible that these previous comparisons do not adequately capture the way people respond to a disaster of this magnitude and alternative comparisons are needed to explain our findings.

This is not the first time disaster has been marked by an apparent improvement in mental health. In fact, the paradoxical effect of hardship on suicidality has been reported previously. An apparent protective effect of war and other disasters against suicidality was first published by the French sociologist Emile Durkheim in 1897, but the phenomenon he observed is not isolated to antiquity.

During the 9 months of the Blitz, German warplanes dropped 41,000 tons of explosives on the city of London, killing 43,000 and wounding over 100,000 more. This large scale “strategic bombing” of cities had never before been endured, and British planners feared a complete societal breakdown, yet despite the destruction of their homes, the deaths of their neighbors, and being forced to live in crowded bomb shelters, no such break down occurred. In fact, psychiatric admissions dropped during the blitz and physicians noted improvement in patients’ symptoms during the period of air raids. A psychiatrist recalled, “chronic neurotics of peacetime now drive ambulances.”¹⁰

During the troubles in Northern Ireland, suicide rates and depression dropped during the peak of violence. Despite riots, gunfire, bombings, and assassinations, the mental health of those living in the most heavily affected areas actually improved. Conversely, depression actually worsened in the less affected areas. Researchers proposed that “when people are actively engaged in a causes their

lives have more purpose ... with a resulting improvement in their mental health.” They further theorize the increase in depression in unaffected areas may be due to an inability to participate in society's struggle.^{11,12}

Similar paradoxical trends were reported following the Spanish civil war and the Cyprus civil war and after large disasters.^{13–15} However, the potential protective effects of conflict or disaster against suicide do not appear to be universal. While Londoners did well during the Blitz, suicide rates among the young men of Scotland soared during WWII, despite decreases among other age groups.¹⁶ In areas of Belfast not as highly affected by the violence during The Troubles, depression and suicide also rose. In the less bombed cities of Germany, morale was reported to be lower than in the cities more heavily bombed. In Scotland, the increase in young male suicides was difficult to explain, but the potential for being a combatant and increased access to firearms were considered the most likely cause of completed suicide. In Ireland and Germany, researches postulated that increased suicidality stemmed from an inability for the residents of these less affected areas to engage in the common struggle. Lyons et al.¹¹ states, “When people are actively engaged in a cause their lives have more purpose ... with a resulting improvement in their mental health.”

Unfortunately, but predictably, active engagement in a pandemic is not universally protective, particularly during the aftermath. During the 2003 SARS pandemic in Hong Kong, increased social isolation, stress, and fear of being a burden on their families drove a 31% increased rate of suicide among the elderly.¹⁷ SARS survivors in Hong Kong were also noted to have an increased risk of suicide following resolution of the pandemic.¹⁸ Health care workers may also be at risk from harder working conditions, fear of contracting the virus, and witnessing hospital resources be overwhelmed.¹⁹ Sadly, at least one physician has already taken her life in New York.²⁰

This study was one of the first to objectively examine rates of suicidal ingestions reported to a poison control system. We feel that it is unlikely that our results represent a selection bias, because despite a decrease in the total number of severe cases, the proportion of cases with severe morbidity did not change, thus representing a similar proportion of significant ingestions. Furthermore, given there was no change in the total number of calls in the 2 years prior to COVID, we do not feel that this trend simply represents a trend of declining use of the poison control system.

LIMITATIONS

Our study does have limitations. The CPCS data are likely to be an underestimate of the total number of ingestions as not all ingestions will be reported to the poison center. However, these limitations should be consistent across both our study period and the previous 2 years used as controls, so we feel our data reflect a true change in the rate of suicidal ingestion between the COVID and pre-COVID eras. Additionally, because this study relies on retrospective analysis, the study is limited by the accuracy of data entry. It is possible cases

were miscoded as another type of exposure (e.g., entered as drug abuse, informational call, accidental ingestion) rather than entered as a suicidal ingestion. However, there is no reason to suspect this occurred in any meaningful amount and any misclassifications would likely be consistent across both the pre-COVID and the COVID eras.

Our data do not include suicides who were found deceased, involved firearms, or utilized other mechanical means for which poison center consultation was not needed. While this limitation may be consistent across both the COVID period and our control period, a disproportionately increased rate of successful home suicides during pandemic or a disproportionate increase in noningestion suicide attempts would be hidden from detection by our study.

Our data may also include repeat presentations by the same patient for multiple different ingestions during the study periods. While this may also be consistent across both periods, its effect cannot be analyzed or excluded.

It is also possible that a decreased rate of emergency department (ED) utilization during the COVID period affected the observed call rates for suicidal ingestion. The site of exposure and site of first call were examined, but are difficult to interpret. Given the diminished ED usage during pandemic, we might expect the number of calls from health care facilities to drop. However, if less suicidal ingestions were occurring, we would also expect calls from health care facilities to fall. Therefore, both a true decrease in suicidal ingestions and a decrease in health care facility use during pandemic will decrease the call rate from health care facilities. The effect on calls from home is even more difficult to predict. Home call rates may fall with a decline in ingestions, but home call rates may also appear stable or even increase as some patients who otherwise would have sought care in the ED decide to call the poison center from home instead. As a result, both a true decrease in the rate of suicidal ingestions and an isolated drop in calls due to avoidance of health care facilities may both result in a lower number of calls from health care facilities and a higher proportion of calls from home.

CONCLUSIONS

This study, involving the nation's largest poison control system, found a decrease in the number of suspected suicidal ingestion calls during the COVID era, compared with the pre-COVID era.

CONFLICT OF INTEREST

The authors have no potential conflicts to disclose.

AUTHOR CONTRIBUTIONS

Sam T. Ontiveros, Alicia B. Minns, and Michael D. Levine conceived the study and F. Lee Cantrell drafted a request for and obtained data from the California Poison Control Center database. Sam T. Ontiveros, Alicia B. Minns, and Michael D. Levine extracted and organized data. Caroline Thomas and Michael D. Levine oversaw the statistical analysis. Sam T. Ontiveros drafted the manuscript, and all authors contributed substantially to its revision. The authors had

access to all data. They have no conflicts of interest to disclose and received no financial support in the preparation of the manuscript.

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