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Research paper

Adult Suicide-Related emergency department encounters during the COVID-19 Pandemic: a Cross-Sectional study

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ABSTRACT

Background: The coronavirus disease 2019 (COVID-19) pandemic resulted in widespread psychosocial disruption, which may impact suicidal thoughts and behaviours. This study characterizes adult suicide-related emergency department (ED) encounters and patient characteristics during the COVID-19 pandemic in 2020 compared to the year prior.

Methods: Retrospective cross-sectional study in a large, integrated, community-based health system of adults (≥18-years-old) with suicide-related ED encounters (defined by the Centres for Disease Control-recommended International Statistical Classification of Diseases [ICD-10-CM] codes) during the COVID-19 pandemic compared to the same period in 2019. Population-level incidence rate ratios (IRRs) compared suicide-related ED encounters in 2020 to 2019. Patient characteristics for the first suicide-related ED visit for each period were used to calculate percent relative change comparing 2020 to 2019.

Findings: Of 10,651 suicide-related ED encounters in 2020 and 11,476 in 2019, 49.6% and 51.6% were for females and the mean age was 38±17 and 38±16 years-old, respectively. Suicide-related ED encounters significantly declined in each month of 2020 (IRR 0.71-0.91, p<.05), but were equivalent to 2019 levels June-August. Adults in 2020 were more likely to have co-occurring substance use disorders (+15•7%; 95% CI 7•0-24•4%) or have no mental health or suicide diagnosis associated with an outpatient visit in the last year (+21•1%, 95% CI: 12•5-29•6) compared to 2019.

Interpretation: Adults with suicidal thoughts and behaviours during the COVID-19 pandemic in 2020 had distinct social and psychiatric characteristics compared to patients in the prior year. These findings can help inform health system responses to mental health needs.

Research in context

Evidence before this study

Given the widespread disruption to daily life caused by the coronavirus disease 2019 (COVID-19) pandemic, many experts have speculated that suicidal thoughts and behaviors would increase. Prior to this study, mean counts of suicide attempts in US emergency departments (EDs) were shown to have increased from March to October of 2020, while overall suicide mortality declined.

Added value of this study

This study provides population-level data regarding the incidence of suicidal thoughts and behaviors of adults during the COVID-19 pandemic, along with their demographic and mental health characteristics.

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Implications of all the available evidence

Adults with suicidal thoughts and behaviors during the COVID-19 pandemic in 2020 had distinct social and psychiatric characteristics compared to patients in the prior year. Understanding population-level changes in patient characteristics may further elucidate how to customize care strategies. These findings can help inform health system responses to mental health needs.

1. Introduction

Suicide is a leading cause of death in adults in the USA. It is the second most common cause of death in adults age 18-34, the fourth in adults aged 35-54 years, and the 10th overall [1]. Over the past two decades, suicide mortality in the USA increased 35%; from 10•5 per 100,000 in 1999 to 14•2 per 100,000 in 2018 [2]. The prevalence of suicidal thoughts and behaviours is higher than deaths alone, with 4•8% of US adults aged 18 years and older reporting serious thoughts about suicide in 2019. Given the widespread disruption to daily life caused by the coronavirus disease 2019 (COVID-19) pandemic, many experts have speculated that suicidal thoughts and behaviours would increase. Indeed, survey data suggest a significant psychological impact of quarantine [3] with surges in anxiety, depression, and substance use [4], which are risk factors for suicidal thoughts and behaviors [5,6]. Studies have found that outpatient mental health encounters have increased at times during the pandemic [7]. Recent reports have shown that mean counts of suicide attempts in US emergency departments (EDs) increased from March to October of 2020 [8], yet overall suicide mortality has declined [9]. Available evidence indicates no change in suicide rates during the initial months of the pandemic [10], however population-level data are lacking regarding the incidence of suicidal thoughts and behaviours of adults during the remainder of COVID-19 pandemic, along with their demographic and mental health characteristics. Such data are needed to clarify relations between the COVID-19 pandemic and adult suicidal thoughts and behaviours.

This study compared adult ED encounters for suicidal thoughts or behaviours during the COVID-19 pandemic to the same period the year prior in a large, integrated health care system serving more than four million patients. Further, we examined the characteristics of patients presenting to the ED with suicidal thoughts or behaviours during the COVID-19 pandemic relative to the same period in 2019. Given the widespread psychosocial disruption and psychological distress caused by the COVID-19 pandemic, we hypothesized that ED encounters for suicidal thoughts and behaviours would increase during the pandemic.

2. Materials and Methods

2.1. Study Setting and Design

This retrospective, observational study took place in Kaiser Permanente Northern California (KPNC), a large community, primarily employer-based, health system in the USA serving more than four million patients (an estimated 30% of the regional population). KPNC patients are highly representative of the ethnic and socioeconomic diversity of the surrounding and state-wide population [11]. The analytic sample was derived using electronic health record (EHR) data for patients seeking emergency care for suicidal thoughts or behaviours between January 1, 2020 to December 15, 2020, and the corresponding dates in 2019. The Research Determination Committee for KPNC determined that the project does not meet the regulatory definition of research involving human subjects per 45 CFR 46. 102(d). The research was conducted in accordance with the principles of the Declaration of Helsinki.

2.2. Measurements

Encounters for suicidal thoughts and behaviours were determined using International Statistical Classification of Diseases and Related Health Problems, clinical modification (ICD-10-CM) diagnostic codes recommended by the Centres for Disease Control and Prevention: R45.85, T14.91, T36.xx3(4)-T50.xx2(4), T51.xx2(4)-T65.xx2(4), T71.xx2(4), X71-X83 [12]. Choice of primary measure: ICD-10-CM codes provide a standardized way to report EHR data and are widely used for such studies. Patient-level characteristics were abstracted from the first suicide-related encounter for the time period of KPNC members with at least 1-year of membership. Acuity at ED presentation was defined as visits coded as resuscitative, emergent, or urgent. Patient diagnoses associated with the suicide-related ED encounter were categorized as follows: mental health substance use (psychiatric diagnoses F10-19, excluding tobacco usage); mental health non-substance (psychiatric, including: F20-29, F30-31, F32-39, F40-43.12, F43.2-43.9, and F70-98); and other non-mental health diagnoses (representing <1% of patient visits) according to ICD-10-CM diagnostic codes. We collected a history of encounters associated with a mental health or suicide diagnosis in the past one and two years in any outpatient (in-person or telehealth) setting, or in emergency or inpatient settings in the last year, as a dichotomous variable. State-wide COVID-19 case and hospitalization data were from Government Operations Agency sponsors data.ca.gov, a state-wide open data portal.

2.3. Primary Data Analysis

Monthly data from 2019 and 2020 for suicidal thought and behaviour ED encounters relative to the health system population for adults 18-years-old or older (per 100,000 persons) were used to calculate incidence rates (IRs) and IR ratios (IRRs) using a Poisson model fitted as a log-linear regression with an offset equal to the natural logarithm of person-time for each month. As these data aim to capture the incidence of suicide-related ED encounters, the same individual may be represented more than once in these data. Unique patient-level data were examined and compared between the two years for an individual member's first visit to the ED for suicidal thoughts or behaviours during either period. For this analysis, data were limited to patients with one year of continuous membership to facilitate capture of demographic and health history variables. We obtained the percent relative change by dividing the difference in proportion risk in each period by the corresponding proportion in 2019: [(%2020 – %2019)/ %2019]*100 (i.e. [relative risk -1] *100).

A two-sided $p < .05$ was considered statistically significant. All analyses were conducted with SAS (version 9.4; SAS Institute, Inc., Cary, NC).

2.4. Role of the Funding Source

This project was supported by The Permanente Medical Group (TPMG) Delivery Science and Applied Research program. Drs. K. Ridout's and Vinson's time was supported by The Permanente Medical Group's Physician Researcher Program. The funding source had no role in the design and conduct of the study; collection, management, analysis, or interpretation of the data; preparation, review, or approval of the manuscript; or decision to submit the manuscript for publication.

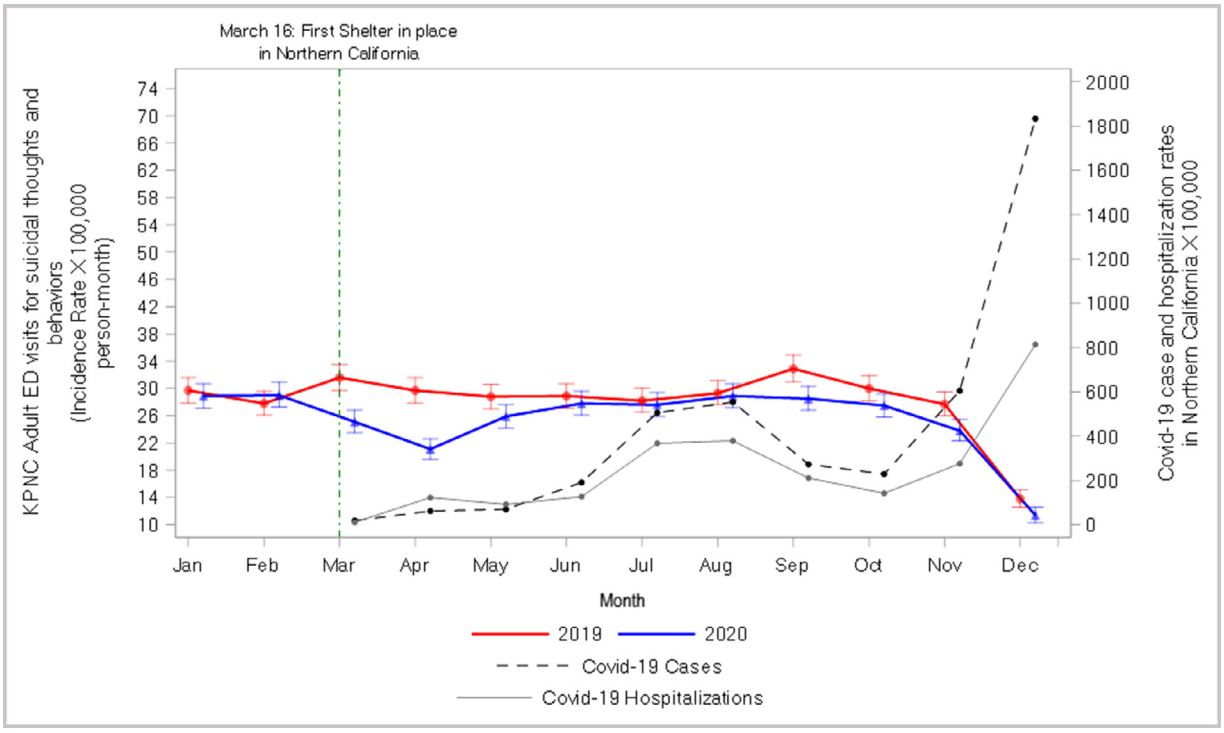

Figure 1. Monthly adult emergency department encounters for suicidal thoughts and behaviors for 2019, 2020
Overall emergency department (ED) visits for suicidal thoughts or behaviors for adults 18-years-old or older. ED visits for suicidal thoughts or behaviors decreased after the initial California shelter-in-place orders, as did overall ED volume during this time. ED visits for suicidal thoughts or behaviors returned to 2019 levels towards the beginning of June through August 2020, then decreased below 2019 levels again from September 2020 forward. ED utilization and Kaiser Permanente Northern California (KPNC) population data obtained from The KPNC electronic health record; statewide COVID-19 case and hospitalization data were from Government Operations Agency sponsors data.ca.gov, a statewide open data portal. COVID-19 = coronavirus disease 2019; Jan=January; Feb=February; Mar=March; Apr=April; Jun=June; Jul=July; Aug=August; Sep=September; Oct=October; Nov=November; Dec=December.

Table 1
Incidence rate ratios (IRRs) for adult emergency department encounters for suicidal thoughts or behaviors 2019, 2020

Month	IR 2019	N 2019	IR 2020	N 2020	IRR (95% CI)	P-value
January	29.7, (27.9,31.6)	1006	28.9, (27.1,30.7)	999	0.97 (0.89, 1.06)	0.513
February	27.8, (26.1,29.6)	943	29.0, (27.3,30.9)	1013	1.05 (0.96, 1.14)	0.327
March	31.6, (29.7,33.5)	1072	25.1, (23.5,26.8)	875	0.79 (0.73, 0.87)	<.0001
April	29.7, (27.9,31.6)	1007	21.1, (19.6,22.6)	735	0.71 (0.65, 0.78)	<.0001
May	28.8, (27,30.6)	976	25.9, (24.2,27.6)	903	0.90 (0.82, 0.98)	0.021
June	28.9, (27.1,30.7)	979	27.8, (26.1,29.6)	970	0.96 (0.88, 1.05)	0.396
July	28.2, (26.5,30.1)	957	27.6, (25.9,29.4)	963	0.98 (0.89, 1.07)	0.612
August	29.3, (27.6,31.2)	995	28.9, (27.2,30.7)	1009	0.98 (0.90, 1.07)	0.728
September	32.9, (31,34.9)	1115	28.5, (26.8,30.3)	997	0.87 (0.80, 0.94)	0.001
October	30.0, (28.2,31.9)	1019	27.5, (25.8,29.2)	959	0.91 (0.84, 1.00)	0.046
November	27.7, (26,29.5)	940	23.8, (22.3,25.5)	832	0.86 (0.78, 0.94)	0.002
December	13.8, (12.6,15.1)	467	11.4, (10.3,12.6)	396	0.83 (0.73, 0.95)	0.006

IR=incidence rate; CI=Confidence Interval. IR calculated with respect to the average Kaiser Permanente Northern California adult population per month.

3. Results

3.1. Adult suicide-related ED encounters during the COVID-19 pandemic

There were 10,651 adult suicide-related ED encounters (8,190 unique patients) in 2020 and 11,476 (8,949 unique patients) in 2019. The incidence rate of ED suicide-related encounters during the COVID-19 pandemic differed from the year prior (Figure 1). Suicide-related ED encounters declined after the initial local and state shelter-in-place orders in March (IRR 0·79, 95% CI: 0·73 to 0·87, Table 1), April (IRR 0·71, 95% CI: 0·65 to 0·78), and May 2020 (IRR 0·90, 95%CI: 0·82, 0·98); rebounded to pre-pandemic levels from June through August, then decreased for the remainder of 2020, with significantly lower IRRs for September (0·87; 95% CI: 0·80 to 0·94), October (0·91; 95% CI: 0·84 to 1·00), November (0.86; 95% CI: 0·78 to 0·94), and December (0·83; 95% CI: 0·73 to 0·95).

3.2. Characteristics of adults with suicidal thoughts or behaviours during the COVID-19 pandemic

Patient-level characteristics were extracted from the EHR for patients with one-year continuous KPNC enrollment from the ED encounter index date (N=5,390 in 2019 and N=4,671 in 2020). During the 2020 COVID-19 pandemic period, there were no significant differences in the age, race/ethnicity, or gender of patients with suicide-related ED encounters compared to the same time period in 2019 (Table 2) except encounters among adults aged 40-64-

Table 2
Characteristics of adults with suicide-related emergency department (ED) encounters

		March 10th-Dec 15th, 2019 N, % (95% CI)	March 10th-Dec 15th, 2020 N, % (95% CI)	% change= (2020%-2019%)/2019% (95% CI)
Patient Characteristic		N=4,208	N=3,437	
Race	White	2166, 51•5%, (50•0,53•0)	1820, 53•0%, (51•3,54•6)	2•9, (-1•5,7•2)
	Asian	417, 9•9%, (9•0,10•8)	328, 9•5%, (8•6,10•5)	-3•7, (-17•2,9•8)
	African American	422, 10•0%, (9•1,10•9)	326, 9•5%, (8•5,10•5)	-5•4, (-18•7,7•9)
	Latinx	720,17•1%, (16•0,18•2)	598,17•4%, (16•1,18•7)	1•7, (-8•3,11•6)
	Other	386, 9•2%, (8•3,10•0)	264,7•7%, (6•8,8•6)	**-16•3, (-29•9,-2•7)**
	Unknown	97, 2•3%, (1•9,2•8)	101,2•9%, (2•4,3•5)	27•5, (-3•9,58•9)
Age, years	18- 25	1403,33•3%, (31•9,34•8)	1198,34•9%, (33•3,36•4)	4•5, (-1•9,11•0)
	26- 39	1011, 24•0%, (22•7,25•3)	819,23•8%, (22•4,25•3)	-0•8, (-8•8,7•2)
	40- 64	1317,31•3%, (29•9,32•7)	993,28•9%, (27•4,30•4)	**-7•7, (-14•3,-1•1)**
	65+	477,11•3%, (10•4,12•3)	427,12•4%, (11•3,13•5)	9•6, (-3•3,22•5)
Gender	F	2472,58•7%, (57•3,60•2)	1963,57•1%, (55•5,58•8)	-2•8, (-6•6,1•0)
	M	1736,41•3%, (39•8,42•7)	1474,42•9%, (41•2,44•5)	4•0, (-1•4,9•3)
Acuity	Resuscitative/ Emergent	3819,90•8%, (89•9,91•6)	3095,90•0%, (89•0,91•1)	-0•8, (-2•2,0•7)
	Urgent	360, 8•6%, (7•7,9•4)	320,9•3%, (8•3,10•3)	8•8, (-6•2,23•9)
	Non-urgent	29, 0•7%, (0•4,0•9)	22,0•6%, (0•4,0•9)	-7•1, (-60•2,45•9)
Diagnoses at ED encounter	Suicide-related Dx only	233, 5•5%, (4•8,6•2)	97,2•8%, (2•3,3•4)	**-49•0, (-65•0, -33•0)**
	Substance Abuse	932,22•1%, (20•9,23•4)	881,25•6%, (24•2,27•1)	**15•7, (7•0,24•4)**
	Psychiatric	2663,63•3%, (61•8,64•7)	2208,64•2%, (62•6,65•8)	1•5, (-1•9,4•9)
	Non-mental health	380, 9•0%, (8•2,9•9)	251,7•3%, (6•4,8•2)	**-19•1, (-32•7, -5•5)**
Disposition post ED	Home	2046,48•6%, (47•1,50•1)	1604,46•7%, (45•0,48•3)	-4•0, (-8•6,0•6)
	Inpatient	2162,51•4%, (49•9,52•9)	1833,53•3%, (51•7,55•0)	3•8, (-0•6,8•2)
Mental health or suicide diagnosis associated with an outpatient visit in the last two years	No	604,14•4%, (13•3,15•4)	613,17•8%, (16•6,19•1)	**24•3, (12•7,35•8)**
	Yes	3604,85•6%, (84•6,86•7)	2824,82•2%, (80•9,83•4)	**-4•1, (-6•0,-2•1)**
Mental health or suicide diagnosis associated with an outpatient visit in the last year	No	975,23•2%, (21•9,24•4)	964,28•0%, (26•5,29•5)	**21•1, (12•5,29•6)**
	Yes	3233,76•8%, (75•6,78•1)	2473,72•0%, (70•5,73•5)	**-6•3, (-8•9,-3•8)**
ED visit for mental health or suicide in last year	No	3798,90•3%, (89•4,91•2)	3116,90•7%, (89•7,91•6)	0•4, (-1•0,1•9)
	Yes	410, 9•7%, (8•8,10•6)	321,9•3%, (8•4,10•3)	-4•1, (-17•7,9•4)
Psychiatric inpatient in the last year	No	3957, 94•0%, (93•3,94•8)	3207,93•3%, (92•5,94•1)	-0•8, (-1•9,0•4)
	Yes	251, 6•0%, (5•2,6•7)	230,6•7%, (5•9,7•5)	12•2, (-6•3,30•6)

ED=emergency department, CI=confidence interval. Percent relative change is calculated as follows: [(%2020 – %2019)/ % 2019]*100. For diagnoses at ED encounter, all patients had a suicide diagnosis. Only one additional diagnosis in addition to the suicide code was pulled per patient encounter. Only first encounters in the given time frame were included for patients with one-year continuous Kaiser Permanente insurance from the ED index date. Bolded text indicated CI did not cross zero.

years-old, which were lower (-7•7, 95% CI: -14•3, -1•1), and among those reporting race as 'Other' (-16·3, 95% CI: 29·9, 2·7). There was no difference in acuity of suicide-related visits.

3.3. Co-occurring mental health diagnoses and mental health history

Compared to 2019, the primary diagnosis during ED encounters in 2020 differed, with 15•7% higher substance use disorders (95% CI: 7•0, 24•4), and 49•0% lower individuals presenting with suicidal thoughts or behaviours alone (95% CI: -65•0, -33•0). There was an increase in patients with suicide-related ED encounters without a two-year history of a mental health or suicide diagnosis in any outpatient setting (24·3% in 2020 compared to 2019; 95% CI: 12·7, 35·8), or a history of mental health or suicide diagnosis in any outpatient setting in the last year (21·1% higher, 95% CI: 12·5, 29·6). There was no significant change in the proportion of adults seeking care with a history of psychiatric inpatient hospitalization or previous ED encounters for suicidal thoughts or behaviours or mental health.

4. Discussion

These data show that, during the COVID-19 pandemic in 2020, rates of adult suicide-related ED encounters did not increase and at times decreased as compared to rates in 2019. Most of the demographic characteristics of patients did not change between the two time periods. However, a significantly greater proportion of patients presenting for suicide-related encounters in 2020 had a substance use disorder documented at the time of the ED encounter and had no two-year history of outpatient encounters for mental health or suicide diagnoses compared to 2019.

Suicide-related ED visits were lower than expected given 2019 levels specifically during the initial local and state shelter-in-place orders (March through May) and in the fall of 2020. These changes could reflect decreased suicidal thoughts and behaviours in this population, a decreased need for ED visits during the pandemic, or avoidance of the ED environment due to pandemic-related concerns. A recent report showed an absolute reduction in suicide-related mortality in 2020 compared to the year prior in the total US population [9]. Interpreted together, it seems the reduction in ED encounters for suicidal thoughts and behaviours may reflect patient symptoms. Previous reports showed an increase in suicide-related ED encounters after the national, 15-day proclamation to shelter-in-place relative to all ED encounters [8], but a decrease in absolute numbers relative to the population in 18-25-year-olds [13]. Differences between studies are likely explained both by continued state-wide shelter-in-place orders, the denominators used, and by the age groups included in the studies. In this investigation, we examined ED encounters for adults aged 18 years and above, while the previous report included individuals 10 years or older [8]. Separately, we examined suicidal thoughts and behaviours in youth 5- to 17-years-old and found that youth suicide-related ED encounters accounted for a larger proportion of ED visits during the pandemic compared to the year prior [14]. Of note, in the current analysis, there was a 7.7% decrease in suicide-related ED visits by adults 40-64-years-old, which likely contributes to the overall decrease in ED visits for suicidal thoughts or behaviours. It is unclear if these trends represent reactions to the pandemic or secular trends in suicidal thoughts and behaviours in this population.

There were no differences in the race/ethnicity or gender of patients with suicide-related ED encounters compared to 2019; however, there was a significant change in the other problems diagnosed at the time of the ED encounter in addition to suicidal thoughts or behaviours, with relatively more encounters having co-occurring substance use diagnoses. These data are consistent with national studies of substance use during the pandemic [15-17], and with our findings of increased encounters for substance use disorders during the initial months of the COVID-19 pandemic [7]. People may be using alcohol or drugs to cope with the psychological stressors of the pandemic, triggering or exacerbating such disorders. Additionally, fewer patients presenting with suicidal thoughts or behaviours had a history of any outpatient encounter for a mental health diagnosis in their medical record for the last one or two years. Together, these data suggest that there were significant changes in the co-occurring mental health diagnoses and mental health history of patients seeking ED care for suicidal thoughts or behaviours during the pandemic.

Study limitations include the use of KPNC EHR data only. Patients presenting with suicidal thoughts or behaviours to non-KPNC facilities or patients experiencing these symptoms but not seeking care are not represented. We did not have access to reliable and recent suicide death data occurring outside of KPNC facilities, which again could lead to underestimates in the incidence of suicidal behaviours. As we examined 2019 and 2020 data only, these data may reflect secular trends in suicide; further longitudinal data is needed. We did not evaluate suicidal thoughts and behaviours separately given the diagnostic overlap of the ICD-10-CM codes clinically; this could be an area of future study.

These findings suggest that, despite large psychosocial disruption, fewer adults presented to the ED for suicidal thoughts or behaviours compared to 2019. In our previous work, we reported a large increase in telehealth for outpatient mental health care during the initial months of the COVID-19 pandemic [7]. Most of these outpatient encounters were for individuals with a history of mental health care in the outpatient setting [7]. It may be that for patients familiar with seeking outpatient mental health care, connecting with outpatient resources during the pandemic is somewhat easier, preventing suicide-related ED encounters. However, there were more patients presenting to the ED with suicide-related concerns with no history of mental healthcare in outpatient settings in the last one or two years. These data can help inform future work aimed at modelling and making inferences about this population. Future work is needed to examine these findings in the context of broader secular trends. Novel care strategies, such as technology-based care [18], and investing in ED-based resources may also be valuable in addressing the needs of this population. Understanding population-level changes in patient characteristics may further elucidate how to customize care strategies and contextualize these findings as relative to overall demographic changes in the KPNC population. Finally, psychologically vulnerable populations may be especially susceptible to substance use in response to environmental stressors, and identification and prevention efforts could help reduce these risky behaviours closely related to suicidal thoughts and behaviours.

Contributors

All authors made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; drafting the work or revising it critically for important intellectual content; final approval of the version to be published. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The corresponding author and the senior author had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. M. Alavi also had access to the dataset to perform analyses. The authors certify that the manuscript represents valid work and that neither this manuscript nor one with substantially similar content under their authorship has been published or is being considered for publication elsewhere.

Data sharing statement

Kaiser Permanente does not release datasets related to patient data. Data is derived from EHR records. Any supporting results or data, including explanations about the structure of the data or how it was obtained beyond the scope of the materials and methods section can be obtained from the corresponding author.

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Declaration of interests

The authors report no conflicts of interest.

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