Original article

Crisis Response and Suicidal Patterns in U.S. Youth Before and During COVID-19: A Latent Class Analysis

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A B S T R A C T

Purpose: This study characterized the unobserved patterns in crisis response among youth in the U.S. from March to December 2020 and determined the characteristics of vulnerable subgroups who were at increased risk for suicide due to the pandemic.
Methods: A latent class analysis of crisis support-seeking from a national text-based crisis platform, (n = 179,497, aged 24 years or younger) for 11 crisis concerns (e.g., depression, anxiety/stress, suicidal thoughts, isolation, abuse, bereavement, relationships) was performed on three study periods: (1) January 2017 to December 2020, (2) prepandemic: 1 January 2017 to 12 March 2020, and (3) pandemic: 13 March to 20 December 2020. Demographic characteristics (age, race/ethnicity, sexual orientation, and gender identity) were used as predictors for class membership using the three-step method.
Results: Four latent classes were identified: (1) depression/isolation/self-harm (D/I/S) (18,694 texters, 10.4%), (2) interpersonal stress/mood-anxiety (I/M) (32,640 texters, 18.2%), (3) suicidal thoughts/depressed (S/D) (34,067, 19.0%), and (4) adjustment/stress (A/S) (94,096 texters, 52.4%). During the pandemic, an increase in suicidal thoughts and active rescues occurred in the D/I/S and S/D higher-risk subclasses. Characteristics of vulnerable groups in higher-risk classes since the pandemic included children, LGBTQ, American Indian, White, Black, Asian, female, and gender-nonconforming youth.
Conclusions: Results identified a strong association with class membership in more severe risk classes during the pandemic and an increase in suicidal help-seeking, particularly among children and LGBTQ youth. Low-cost and targeted crisis text-based platforms for support-seeking in youth may be one potential safety net strategy to address the effects of the COVID-19 pandemic on mental health in youth.

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IMPLICATIONS AND CONTRIBUTION

Few studies have examined suicidal behaviors in response to the COVID-19 pandemic for U.S. youth. This study identified four distinct crisis profiles in U.S. youth. Membership in more severe risk classes was strongly associated with the pandemic, and an increase in suicidal help-seeking was observed, particularly among children and LGBTQ youth.

School closures, home confinement, grief, family violence, excessive internet use, and pandemic-imposed restrictions to "normal" life have resulted in feelings of isolation and loneliness among youth [1,2]. As the pandemic persists, young people are grappling with the financial insecurity of their parents and

unaddressed issues relating to bereavement and other symptoms of mental distress [3,4]. The emerging literature on the psychological consequences of the pandemic in children and adolescents has largely consisted of systematic reviews [5,6]and cross-sectional surveys [7,8] with only limited data on young people in the U.S. and in the early phase of the pandemic (March–July). Experts warn that suicidal behaviors may increase due to the pandemic, but actual suicide rates may not peak until months later [9]. Stress, bereavement, and other mood-related conditions (e.g., depression) are likely to precede suicidal ideation and self-harm [9]. There is a pressing need to study the short- and long-term effects of the pandemic on child and adolescent mental health, with a special focus on changes in suicidal thoughts and behaviors.

New digital applications, such as text-based crisis platforms, are uniquely poised to provide broad mental and behavioral support to youth in need [10]. These emerging technologies can be used innovatively to fill a critical gap in national public health surveillance efforts on the psychological impact of the pandemic on children and adolescents [11], yet no U.S.-based studies have leveraged these data platforms. We partnered with Crisis Text Line (CTL), a national not-for-profit organization in the U.S. that provides a free and confidential crisis texting service that is available 24/7 support. The objective of this study was to perform a latent class analysis (LCA) to (a) characterize crisis concern profiles in young people using a national anonymized crisis texting platform, (b) determine if the COVID-19 pandemic was associated with distinct crisis profiles, (c) examine sociodemographic characteristics for the distinct crisis profiles, and (d) assess the likelihood of being flagged as high risk for suicide in the pandemic compared with the prepandemic period. LCA is a person-centered approach used to determine distinct patterns in subgroups by estimating a categorical latent variable that determines homogenous classes within a much larger and complex population and set of outcome(s) [12]. Advantages include the phenotypic characterization of vulnerable subgroups that can be targeted for public health interventions.

Methods

Design and CTL data

Data on crisis response were derived from CTL, a national text-based crisis platform. Crisis counselors connect with individuals in crisis and assist texters in crisis by using empathetic listening, resource sharing, and collective problem-solving. To date, approximately six million texts have been exchanged, and CTL currently has the largest repository of near real-time mental health data in the world (Crisis Trends 2018). Three cross-sectional cohorts were constructed: (1) *Full:* texters in contact with CTL from January 1, 2017 to December 2, 2020, (2) *prepandemic:* texters from January 1, 2017 to March 12, 2020, and (3) *pandemic:* texters from March 12, 2020 to December 2, 2020. Cross-sectional cohorts are an underutilized design for studying the episodic nature of some health conditions such as mental health. CTL makes it optional for texters to provide demographic information, and most of the texters opt out of providing this information. The original data set contained 354,814 texters, and only 179,497 texters had a valid response for age, race/ethnicity, and gender identity.

Crisis response topics

New research has shown a wide array of emotional and psychological reactions for young people in response to the pandemic, including elevated stress, anxiety, depression, suicidal thoughts, loneliness, grief, eating disorders, abuse, and substance abuse [7,8,13–16]. For the identification of latent subclasses, we included the following crisis topics as binary item responses and mental health proxies in our analysis: depressed, suicidal thoughts, self-harm, stress and anxiety, relationship issues, substance abuse, bereavement, bullying, eating disorder (i.e., eating/body image issues), isolation, and abuse (i.e., emotional, physical, or sexual). Crisis counselors label text conversations with 'issue tags' (e.g., suicidal thoughts, self-harm, depression). As texters can be flagged with multiple tags, the Jaccard similarity coefficient [17,18] was used to visualize the co-occurrence of crisis tags (Table A1).

Covariates

Mental health response in young people varies by age, gender identity, sexual orientation, and across racial/ethnic groups [18–20]. Potential covariates included the following: age (children '13 years or younger', adolescents and young adults '14–24 years'), gender identity (female, male, nonconforming, other), and race/ethnicity (American Indian/American Native, Asian, Hispanic, Black or African American, White, other). A COVID-19 indicator variable was created and assigned '1' to a texter who had any contact with CTL after the 13th of March 2020 (start of White House stay-at-home orders in the U.S.) and '0' otherwise. A texter's sexual orientation was flagged as LGBTQ (yes = 1, no = 0).

All crisis topics were conceptualized as normal risk by CTL [1], except for suicidal thoughts and self-harm characterized as medium risk. To understand the most severe crisis concerns, we included texters at high risk for suicide (e.g., imminent risk [IR] or active rescue [AR]). A texter presenting with suicide ideation, a plan to end their life, means, and an imminent timeframe (typically within 48 hours) were considered to be an IR. If CTL was not able to de-escalate and help the texter separate from the means of harm and work toward a safety plan, an AR was initiated by a CTL supervisor. AR and IR were flagged as '1' if a texter met these criteria.

Statistical analysis

Descriptive statistics were calculated to examine demographic characteristics and crisis topics. The data were shown as overall proportions of texts and then subset to individual texters engaging with the platform during the study period.

Latent class analysis

A 3-step LCA was used to identify vulnerable subclasses of youth with similar crisis responses that involved step 1: establish a latent class model, step 2: assign texters to latent classes, and step 3: latent class scores are related to covariates of interests (e.g., age, gender, race/ethnicity). Relative to the 1-step method, the 3-step Bolck-Croon-Hagenaars method improves covariate selection by accounting for classification uncertainty of latent classes and provides more flexibility in incorporating external variables (e.g., covariates, distal outcome) [21,23]. A weighted

multinomial logistic regression with posterior probability-based multiple imputations (i.e., pseudo-class draws) [22] assessed the influence of covariates in predicting class membership. Four models corresponding to distinct research questions were estimated: (1) *model 1:* latent class model with covariates, (2) *model 2:* multigroup latent class model, (3) *model 2a:* latent class model for the prepandemic, and (4) *model 2b:* latent class model for the pandemic period. For all models, a preliminary model based on k = 1:6 number of potential classes was performed, and each model was replicated 100 times. Models that did not converge to the same solution in at least 50% of the repetitions were considered 'unidentifiable' [12]. The number of latent classes was finalized by inspecting Bayesian information criterion and the bootstrap likelihood ratio test [23].

Because multiple latent class models were fitted, each model is elaborated in the following:

Question 1: Is COVID-19 a predictor of class membership?. The full cohort was examined to determine if the pandemic was associated with class membership. We identified crisis response behavior subgroups of young people across demographic characteristics as a secondary objective to better understand how COVID-19 was associated with group membership. In *model 1*, a texter was flagged as COVID-19 = 1 if they had at least one conversation with CTL after March 13, 2020 (conceptualized start date for the lockdown). The covariates included were texter age, race/ethnicity, gender identity, sexual orientation, AR, IR, and COVID-19.

Question 2: Does crisis response among texters engaging with CTL in the prepandemic and pandemic periods differ?. A multigroup LCA analysis was performed for *model 2* to determine whether or not texters engaging with CTL before and during the pandemic should be considered as distinct user populations. In this model, we compared the prepandemic cohort with the pandemic cohort. As significant differences in the item response probabilities were observed between groups, no parameter constraints were added to avoid mis-specification of the model [12]. Latent class models were estimated using Mplus, version 8.5 [22]. The study was reviewed by the North Carolina State University Institutional Review Board and deemed exempt (protocol#: 23,563).

Results

Descriptive statistics

Table 1 highlights the demographic composition of the texters and the number of texters flagged with each crisis response outcome for the (a) full, (b) prepandemic, and (c) pandemic cohorts. In general, a larger proportion of children (13 years or younger), gender-nonconforming youth, and texters identifying as Asian, American Indian/Alaska Native, or Hispanic engaged with the service during the pandemic. A notable increase in the prevalence of all crisis topics included in the analysis was observed since the pandemic, which may be due to texters reporting four or more topics per conversation (Figure S1).

Question 1: COVID-19 as a predictor of class membership (model 1)

A four-class model best represented our data (see Table A2), and item response probabilities are in Figure 1. The four classes were as follows: (1) depression/isolation/self-harm (D/I/S) (18,694

Table 1
Demographic characteristics for all texters and then for texters in the COVID-19 and baseline cohorts

Groups	Texters (2017–2020) n (%)	Pandemic cohort[a] n (%)	Prepandemic cohort[b] n (%)	p value[d]
Total	179,497	53,671	125,826	
Age				<.0001
13 years or younger	23,836 (13.28)	8,369 (15.59)	15,467 (12.29)	
14–24 years	155,661 (86.72)	45,302 (84.41)	110,359 (87.71)	
Gender identity				<.0001
Female	140,932 (78.51)	42,656 (79.48)	98,276 (78.1)	
Male	21,953 (12.23)	5,411 (10.08)	16,542 (13.15)	
Nonbinary	7,181 (4)	2,534 (4.72)	4,647 (3.69)	
Other	9,431 (5.25)	3,070 (5.72)	6,361 (5.06)	
Transgender	21,431 (11.94)	6,795 (12.66)	14,636 (11.63)	
Sexual orientation				<.0001
LGBTQ	9,393 (5.23)	3,687 (6.87)	5,706 (4.53)	
Race/ethnicity				<.0001
Black/African American	21,413 (12.27)	6,795 (12.66)	14,636 (11.63)	
American Indian/ Alaska Native	8,227 (4.58)	2,226 (4.15)	6,001 (4.77)	
Asian	11,736 (6.73)	3,875 (7.22)	7,863 (6.25)	
Hispanic	34,709 (19.34)	10,549 (19.65)	24,160 (19.2)	
Other[c]	1,583 (.88)	433 (.81)	1,150 (.91)	
White	96,724 (53.89)	28,217 (52.57)	68,507 (54.45)	
Crisis topic				
Abuse	22,377 (12.47)	8,826 (16.44)	13,551 (10.77)	<.0001
Active rescue	2,399 (1.34)	935 (1.74)	1,464 (1.16)	<.0001
Bereavement	12,985 (7.23)	5,519 (10.28)	7,466 (5.93)	<.0001
Bullying	13,020 (7.25)	4,360 (8.12)	8,660 (6.88)	<.0001
Depressed	99,472 (55.42)	34,244 (63.8)	65,228 (51.84)	<.0001
Eating disorder	14,377 (8.01)	6,259 (11.66)	8,118 (6.45)	<.0001
Imminent risk	8,063 (4.49)	3,576 (6.66)	4,487 (3.57)	<.0001
Isolation	61,268 (34.13)	24,290 (45.26)	36,978 (29.39)	<.0001
Relationship issues	87,637 (48.82)	31,224 (58.18)	56,413 (44.83)	<.0001
Self-harm	40,864 (22.77)	16,079 (29.96)	24,785 (19.7)	<.0001
Stress and anxiety	89,289 (49.74)	32,581 (60.71)	56,708 (45.07)	<.0001
Substance abuse	5,828 (3.25)	2,345 (4.37)	3,483 (2.77)	<.0001
Suicidal thoughts	67,604 (37.66)	23,063 (42.97)	44,541 (35.4)	<.0001

[a] Time period for the pandemic cohort = 13 March 2020 and 2 December 2020.
[b] Time period for the prepandemic cohort = 1 January 2017 and 12 March 2020.
[c] The other group corresponds to those texters who did not want to be associated with traditional definitions of gender identity.
[d] The chi-square goodness of fit test revealed that the proportion of texters in the pandemic compared with the prepandemic period was higher for each age group, gender identity, and racial/ethnic group as well as for each crisis topic.

texters, 10.4%) with the highest probabilities for all crisis topics. Most prominent were the probability of depression (.97), isolation (.81), relationship issues (.91), self-harm (.7), stress and anxiety (.90), and suicidal thoughts (.90). (2) Interpersonal stress/mood-anxiety (I/M) (32,640 texters, 18.2%) reporting high probability of depression (.85), isolation (.71), relationship issues (.83), and stress and anxiety (.66). (3) Suicidal thoughts/depressed (S/D) (34,067 texters, 19%) characterized by a high probability of depression (.74) and suicidal thoughts (.81). (4) Adjustment/stress (A/S) (94,096 texters, 52.4%) with the highest probability for stress and anxiety (.44) and relationship issues (.42).
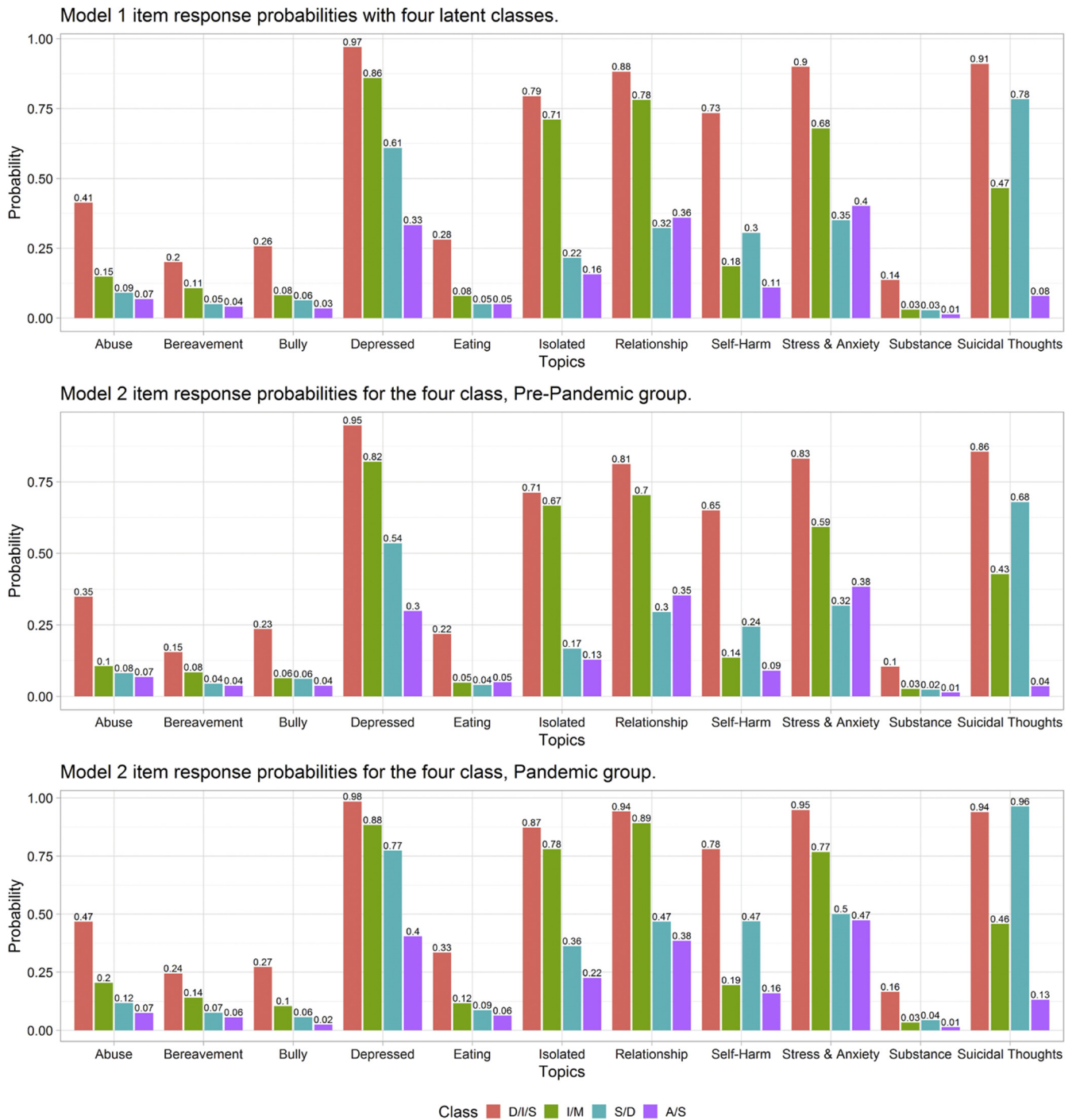
Model 1 item response probabilities with four latent classes.

Model 2 item response probabilities for the four class, Pre-Pandemic group.

Model 2 item response probabilities for the four class, Pandemic group.

Figure 1. Conditional probabilities of individual indicators for each of the four latent classes when looking across all crisis concerns for each model.

Table 2 shows covariates associated with class membership in *model 1.* Relative to the A/S class (the reference group), a texter engaging since the pandemic was 3.7 times more likely to be in the D/I/S class (95%: 3.60, 3.97) and 2.4 times more likely to be in the I/M class (95%: 2.25, 2.46). Compared with A/S, D/I/S texters were more likely to be children, female, gender-nonconforming, White, American Indian/Alaska Native, or LGBTQ. Compared with A/S texters, S/D texters were more likely to be Black/African American, gender-nonconforming, or American Indian/Alaska Native, and I/M texters were more likely to be gender-nonconforming or Asian (Table 3). The large odds ratios (ORs) for AR and IR suggest high probabilities of membership in D/I/S, I/M, and S/D classes relative to the A/S class (Table 4).

Table 2
Adjusted odds ratios (aORs) and 95% confidence intervals (CIs) for covariates associated with the four different latent classes

	Model 1[a]					
	D/I/S-A/S aOR (95% CI)	I/M-A/S aOR (95% CI)	S/D-A/S aOR (95% CI)	D/I/S-I/M aOR (95% CI)	D/I/S-S/D aOR (95% CI)	S/D-I/M aOR (95% CI)
COVID	3.77 (3.58–3.97)***	2.35 (2.25–2.46)***	.78 (.74–.83)***	1.60 (1.49–1.72)***	4.82 (4.52–5.13)***	.33 (.31–.36)***
LGBTQ	6.40 (5.90–6.94)***	2.16 (1.93–2.42)***	1.12 (1.00–1.25)***	2.96 (2.61–3.35)***	5.73 (5.13–6.40)***	.52 (.45–.60)***
Age						
13 years or younger	1	1	1	1	1	1
14–24 years	.58 (.54–.62)***	1.03 (.95–1.10)	.57 (.54–.61)***	.56 (.51–.62)***	1.01 (.94–1.08)	.56 (.53–.61)***
Gender						
Male	1	1	1	1	1	1
Female	1.92 (1.74–2.11)***	1.04 (.97–1.11)	.86 (.81–.91)***	1.85 (1.64–2.09)***	2.23 (2.02–2.47)***	.83 (.76–.91)***
Nonconforming	2.28 (1.99–2.62)***	.77 (.65–.90)**	2.05 (1.84–2.29)***	2.97 (2.39–3.68)***	1.11 (.96–1.29)	2.67 (2.22–3.21)***
Other	2.78 (2.45–3.15)***	.85 (.74–.97)*	1.65 (1.50–1.82)***	3.28 (2.71–3.96)***	1.68 (1.47–1.93)***	1.95 (1.66–2.29)***
Race						
White	1	1	1	1	1	1
Black/African American	.63 (.58–.69)***	1.01 (.94–1.08)	1.17 (1.09–1.24)***	.62 (.56–.70)***	.54 (.49–.59)***	1.16 (1.06–1.27)**
Hispanic	.57 (.53–.61)***	.89 (.84–.94)***	.94 (.89–1.00)*	.64 (.58–.71)***	.60 (.56–.66)***	1.06 (.98–1.15)
Asian	.70 (.63–.78)***	1.15 (1.06–1.24)**	.99 (.90–1.08)	.61 (.53–.71)***	.71 (.63–.81)***	.86 (.77–.97)*
Other	.93 (.83–1.06)	.95 (.84–1.07)	1.10 (.99–1.23)	.98 (.82–1.18)	.85 (.74–.98)*	1.16 (.99–1.35)
American Indian/Alaska Native	1.12 (1.01–1.25)*	1.01 (.90–1.13)	1.41 (1.28–1.54)***	1.11 (.94–1.31)	.80 (.71–.90)***	1.39 (1.21–1.60)***

The four different latent classes are (1) depression/isolation/self-harm (D/I/S), (2) interpersonal stress/mood-anxiety (I/M), (3) suicidal thoughts/depressed (S/D), and (4) adjustment/stress (A/S) for *model 1*.

[a] Model 1 included the two covariates, active rescue (AR) and imminent risk (IR). In the event that the numerator is larger than the denominator, the OR will extend from 1 to infinity; when the denominator is larger than the numerator, the OR will extend from 0 to 1. For our comparison (e.g., D/I/S vs. A/S), the numerator for AR was much larger than the denominator, resulting in large ORs. We, therefore, opted to report the more symmetrical natural *log* of the odds ratios in Table 4 to better compare the odds of AR or IR for individual classes.

Question 2: Description of vulnerable subgroups in prepandemic and during the pandemic (model 2)

Multigroup LCA analysis again identified four latent classes (Table A2, Figure 1) that were labeled based on the most prevalent crisis topics: A/S, I/M, S/D, and D/I/S (Figure 1). Results suggest that help-seeking behaviors among texters engaging with CTL during the pandemic were distinct from crisis behaviors for texters engaged in the prepandemic period, as evidenced by latent classes composed of differing probabilities for crisis topics.

Table 3
Adjusted odds ratios (aORs) and 95% confidence intervals (CIs) for covariates associated with the four different latent classes

	Prepandemic cohort (model 2a[a])			Pandemic cohort (model 2b[a])		
	D/I/S-A/S aOR (95% CI)	I/M-A/S aOR (95% CI)	S/D-A/S aOR (95% CI)	D/I/S-A/S aOR (95% CI)	I/M-A/S aOR (95% CI)	S/D-A/S aOR (95% CI)
LGBTQ	4.92 (4.44–5.46)***	1.70 (1.44–2.02)***	.99 (.86–1.13)	5.89 (5.13–6.76)***	2.31 (1.80–2.96)***	1.31 (1.06–1.63)*
Age						
13 years or younger	1	1	1	1	1	1
14–24 years	.47 (.44–.51)***	1.33 (1.18–1.50)***	.61 (.57–.65)***	.58 (.53–.64)***	.92 (.80–1.05)	.50 (.46–.55)***
Gender						
Male	1	1	1	1	1	1
Female	1.78 (1.60–1.98)***	.86 (.79–.93)***	.82 (.76–.87)***	1.64 (1.42–1.90)***	1.04 (.91–1.19)	1.03 (.90–1.18)
Nonconforming	2.34 (2.03–2.84)***	.73 (.58–.93)*	2.02 (1.77–2.30)***	1.81 (1.47–2.22)***	.42 (.29–.62)***	1.92 (1.59–2.33)***
Other	2.54 (2.19–2.95)***	.78 (.65–.93)**	1.50 (1.34–1.68)***	2.17 (1.79–2.63)***	.65 (.49–.87)**	1.86 (1.55–2.24)***
Race						
White	1	1	1	1	1	1
Black/African American	.72 (.65–.79)***	1.17 (1.07–1.28)**	1.16 (1.08–1.25)***	.73 (.64–.82)***	.99 (.86–1.13)	1.20 (1.07–1.35)**
Hispanic	.63 (.58–.68)***	.94 (.87–1.02)	.95 (.89–1.00)	.69 (.62–.76)***	.98 (.87–1.10)	.98 (.89–1.09)
Asian	.78 (.68–.88)***	1.12 (1.00–1.27)*	1.01 (.92–1.11)	.81 (.69–.94)**	1.18 (1.00–1.38)*	.92 (.78–1.08)
Other	.84 (.72–.98)*	1.05 (.90–1.24)	1.15 (1.02–1.29)*	1.16 (.97–1.38)	.98 (.77–1.25)	.87 (.70–1.08)
American Indian/Alaska Native	1.23 (1.08–1.39)**	1.03 (.88–1.20)	1.42 (1.28–1.57)***	1.26 (1.06–1.49)**	1.09 (.87–1.38)	1.25 (1.04–1.51)*

The four different latent classes are (1) depression/isolation/self-harm (D/I/S), (2) interpersonal stress/mood-anxiety (I/M), (3) suicidal thoughts/depressed (S/D), and (4) adjustment/stress (A/S) for *model 2a* and *model 2b*.

*p value < .05.
**p value < .01.
***p value < .001.

[a] Model 1 included the two covariates, active rescue (AR) and imminent risk (IR). In the event that the numerator is larger than the denominator, the OR will extend from 1 to infinity; when the denominator is larger than the numerator, the OR will extend from 0 to 1. For our comparison (e.g., D/I/S vs. A/S), the numerator for AR was much larger than the denominator, resulting in large ORs. We, therefore, opted to report the more symmetrical natural *log* of the odds ratios in Table 4 to better compare the odds of AR or IR for individual classes.

Table 4
The log-odds and the standard errors of imminent risk and active rescue flags

	Log-odds (SE[a]) with *p* value < .000 unless specified otherwise					
	Active rescue			**Imminent risk**		
Class	**D/I/S-A/S**	**I/M-A/S**	**S/D-A/S**	**D/I/S-A/S**	**I/M-A/S**	**S/D-A/S**
Model						
Model 1	32.37 (.07)	26.39 (4.14)	30.96 (SE < .000)	31.85 (.04)	28.29 (.2)	30.52 (SE < .000)
Model 2a	80.81 (SE < .000)	24.99(SE < .000)	79.17 (.09)	34.66 (3.46)	28.55 (SE < .000)	33.09 (3.46)
Model 2b	24.18 (SE < .000)	−6,768 (SE < .000)	23.42 (.12)	25.09 (SE < .000)	-160.7 (SE < .000)	24.49 (.06)
Class	**D/I/S-I/M**	**D/I/S-S/M**	**S/D-I/M**	**D/I/S-I/M**	**D/I/S-S/M**	**S/D-I/M**
Model						
Model 1	5.98 (4.14) (*p* value = .16)	1.4 (.07)	4.58 (4.14) (*p* value = .269)	3.56 (.203)	1.33 (.04)	2.229 (.21)
Model 2a	55.82 (SE < .000)	1.64 (.09)	54.17 (.09)	6.11 (3.47)	1.57 (.05)	4.54 (3.46)
Model 2b	6,792.30 (SE < .000)	.76 (.12)	6,791.50 (.12)	185.20 (SE < .000)	.605 (.61)	185.19 (.06)

A/S = adjustment/stress; D/I/S = depression/isolation/self-harm; I/M = interpersonal stress/mood-anxiety; S/D = suicidal thoughts/depressed.
[a] Denotes standard error. As the least count of SE in Mplus is .000, SE below the said resolution is denoted as SE < .000.

In general, a significant increase in item response probabilities since the pandemic was observed in all latent classes for the most prevalent crisis topics (depression, isolation, relationship, stress and anxiety). An increase in the probability of having suicidal thoughts was observed in A/S, S/D, and D/I/S during the pandemic. Additional differences are summarized in detail in the following. All reported group-specific item response probabilities were statistically different (*p* value < .001).

A/S—adjustment/stress. For the prepandemic cohort, the crisis tag with the highest probability was stress and anxiety (.38) and relationship issues (.35). The probability of the texter being depressed was .30. All other item responses were less than .13. For the pandemic cohort, response probabilities for stress and anxiety (.47) and feelings of depression (.40) were significantly higher. Although suicide was not an important crisis indicator in this group, the probability for this outcome tripled in 2020 compared to the prepandemic period (.13 vs. .04).

I/M—interpersonal stress/mood-anxiety. For the prepandemic cohort, depression (.82), isolation (.67), relationship issues (.70), and stress and anxiety (.59) were the most prominent crisis tags, followed by suicidal thoughts (.43). Responses for the pandemic cohort increased significantly for the following: isolation (.78), relationships issues (.89), and stress and anxiety (.77). Although not a prominent tag in this cohort, the probability of abuse doubled since the pandemic compare to prepandemic (.1 vs. .2).

S/D—suicidal thoughts/depressed. Compared with the prepandemic cohort, a 41% increase in suicidal thoughts (.68 vs. .96) and 43% increase in depression (.54 vs. .77) occurred since the pandemic. A significant increase from the prepandemic period to the pandemic period was observed for isolation (.17 vs. 36), relationship issues (.30 vs. .47), and stress and anxiety (.32 vs. .50).

D/I/S—depression/isolation/self-harm. Strikingly, item response probabilities for suicidal thoughts (.96), depression (.98), stress and anxiety (.95), relationship issues (.40), isolation (.87), and self-harm (.78) for the pandemic cohort were significantly higher than those for the prepandemic cohort. A texter in the D/I/S group was 22% more likely to report feelings of isolation, 20% more likely to seek help for self-harm, 16% more likely to report

a relationship issue, and 9% more likely to experience suicidal thoughts than a texter in the prepandemic cohort. Bereavement (.15 vs. .24) and abuse (.35 vs. .47) were significantly higher for the pandemic cohort than for the prepandemic cohort.

Characteristics of vulnerable subgroups before and during COVID-19 (models 2a and 2b)

Generally, texters identifying as LGBTQ during the pandemic were significantly more likely to appear in all three higher-risk groups (relative to A/S) than during the prepandemic period (Table 3). American Indian/Alaska Native, female, or gender-nonconforming texters had higher odds of membership in the D/I/S than A/S class during COVID. Compared with texters who identified as A/S since the pandemic, Black/African American, American Indian/Alaska Native, or gender-nonconforming texters exhibited an elevated likelihood of being in the S/D group, and Asians were more likely to be characterized as I/M. When comparing the pandemic versus prepandemic cohorts, we observed a statistically significant increase in the odds of a child texter being in the D/I/S and S/D subclasses relative to A/S. However, the odds of being in D/I/S relative to A/S were lower in the pandemic period for the '14 to 24' age group than the prepandemic (OR: .47, confidence interval: .43−.51 vs. OR: 0.58, confidence interval: .53−.64). Nonconforming and 'other' gender groups showed higher association with both the D/I/S and S/D classes during the pandemic.

Association between class membership and suicide help-seeking during COVID-19

The ORs for AR and IR flags had large magnitudes (Tables 2 and 3); therefore, we opted to report the more symmetrical natural *log* of the ORs in Table 4 to better compare the odds of AR or IR for individual classes. For the prepandemic group, the classes in terms of the highest to lowest risk of AR and IR can be ordered as D/I/S > S/D > I/M > *A/S* based on the log-ORs. For the pandemic group, the AR and IR were ordered by class as follows: D/I/S > S/D > I/M = A/S (high to low). In the pandemic period, the I/M class changed and was no longer associated with the IR and AR supported by the following: (1) The log-odds were large and negative for both AR and IR for the I/M class relative to the A/S

class in model 2b. (2) The log-odds of AR corresponding to class membership in D/I/S relative to I/M are much larger for the pandemic versus prepandemic cohort (6792.3 [standard error {SE} < .000, p value < .00] vs. 55.82 [SE < .000, p value < .00]). Similarly, IR was a statistically significant predictor of class membership for D/I/S relative to I/M in the pandemic cohort; this was not the case for the prepandemic cohort (185.2 [SE < .000, p value < .00] vs. 6.11 [SE: 3.466, p value = .08]).

Discussion

This study identified four distinct CTL risk groups using LCA with 11 crisis concerns for young people in the U.S. The COVID-19 pandemic was an important predictor of class membership in the highest-risk groups (e.g., D/I/S, I/M, and S/D). We observed significant differences in demographic characteristics and suicide help-seeking across the four subclasses, suggesting that some groups based on age, race/ethnicity, gender identity, and sexual orientation may be more likely to seek help for mental health concerns during the pandemic. A significantly higher probability for the most prevalent crisis concerns, such as depression, isolation, relationship issues, stress and anxiety, and suicidal thoughts, has occurred since the pandemic. Notably, Szlyk et al. identified three latent classes from a prior study on CTL users (2013−2017) that were similar to D/I/S, I/M, and A/S, revealing that the S/D class in our analysis was a new cluster that appeared in the CTL population after 2017 [24].

Results from the S/D class during the pandemic revealed an alarming 41% and 43% increase in suicidal thoughts and depression, respectively. Previous studies assessing depressive symptoms, substance abuse, and suicidal ideation during the time of COVID-19 [25−27] have not included younger demographics under the age of 18, and our results show disturbing trends for children in the S/D class since the pandemic. A 20% increase in crisis conversations for self-harm and a 9% increase in texts for suicidal thoughts were observed during COVID-19 (e.g., D/I/S). Although AR and IR were associated with fewer latent classes during the pandemic, suggesting a decrease in the number of texters that CTL considered at high risk, it is important to note that texters in the high-risk classes (D/I/S or S/D) were much more likely to report self-harm and suicidal thoughts, alongside other crisis topics such as depression, stress and anxiety, isolation, and relationship issues that may increase suicidal behavior during the time of COVID-19. Our findings on help-seeking behaviors in youth support emerging research on increased suicide risks among children, adolescents, and young adults during the pandemic and emphasize the critical need for more targeted interventions aimed at individuals in the highest-risk group.

Our study is one of the first to examine youth-specific risk of help-seeking for suicidal ideation during the pandemic from the early months (March−July) to the later stages (August−December). Few studies have been conducted on U.S. youth suicide rates and suicidal behaviors in response to the COVID-19 pandemic. Notable exceptions include summary results from 2020, which demonstrated an overall 5.6% decline in suicides in the U.S. [28]. Results from the U.S. parallel other countries, which observed declines in actual suicides and suicidal behavior for the same time period [29−31]. Emergency department rates for suicidality in youth were higher for some months in 2020 (February to July), but not uniformly higher [13]. Preliminary evidence also demonstrated an increase in suicidal thoughts and attempts in adolescents hospitalized for mental health concerns (April to September) [15]. The CDC reported ED visits for suspected suicide attempts among adolescents (aged 12−17 years) were 1.7 times as high during the summer of 2020 and 2.1 times as high during the winter 2021 compared with the same period in 2019 [33]. A greater frequency of suicide-related behaviors is worrisome in the backdrop of the recent 2019 Youth Risk Behavioral data showing a significant increase in suicidal thoughts, planning, and attempts in U.S. high school students [13].

Findings from this study demonstrated that LGBTQ youth were significantly more likely to be in the highest-risk groups since the pandemic, whereby the likelihood of these youth being a member in the I/M and D/I/S group increased 130 and 490 percent, respectively, in response to COVID-19. LGBTQ youth are at a much higher risk of physical and sexual abuse, depression, suicidality, and self-harm, whereby estimated rates of attempted suicide are 2- to 10-fold higher than their peers [32]. Texters reporting 'other' and 'nonconforming' genders were associated with the highest-risk classes (D/I/S and S/D) for both periods.

Young people may be particularly vulnerable to suicide during the pandemic because of dramatic disruptions to normal routine, fewer opportunities for teachers and peers to observe potential indicators of suicide risk, increased substance abuse/abuse in this age group, and increased distress/grief as a result of family illness/death or economic loss brought on by the pandemic [33,34]. The evidence is emerging concerning an increase or decrease in suicidality in response to the pandemic among youth, but there are a number of risk factors that might explain inconsistent findings, including age, rurality, differences in access and availability of mental health care, and differences in finding mental health care to be acceptable (e.g., telehealth, privacy concerns, lack of access to broadband). Online or text-based support tools were important to this group before COVID-19, and recent research has found texting platforms are a continued support line for vulnerable youth (e.g., LGBTQ) since the pandemic [34].

Our study noted increased help-seeking for depression during the pandemic. Prior research has shown a three-fold higher increase in the prevalence of depression during COVID-19 than prepandemic periods [27]. Although our sample of young people likely does not shoulder the same financial burden as adults, parental stress has been shown to influence mental health among children and adolescents [27,34]. Increased loneliness among youth, loss of in-person support, and an inability to manage emotions may partially explain these disparities in crisis response for younger age groups [5,25], and we found strong co-occurrence of isolation with relationship issues, stress and anxiety, self-harm, and suicidal thoughts that may also in part explain this trend.

Strengths and limitations

Key strengths of this study included the use of CTL's national platform to capture the near real-time response of young people throughout the pandemic with data on a baseline comparative population of users. We used a person-centered approach (e.g., LCA) that included a comprehensive examination of a wide range of crisis response behaviors for at-risk racial and ethnic groups and minority gender and sexual orientation groups that are typically not included or under-represented in national analysis [33]. Our data might serve as reasonable proxy for help-seeking for suicide and other crisis concerns given that texters may be

more likely to use the service and avoid medical settings to reduce the risk of COVID-19 infection.

There are a few limitations that must be considered in interpreting results. A cross-sectional cohort was used to explore the potential changes in crisis response for the prepandemic and pandemic periods with age categories (i.e., 13 years or younger, 14—24 years) predetermined by CTL. Future research should use a latent transition model to examine longitudinal data on crisis pattern change over time for unique CTL users to enhance causal interpretation. Results are from a select group of individuals willing to seek support when in crisis and may not be generalizable to the U.S. as a whole. However, given the anonymity and free 24/7 access to CTL's digital platform, help seekers may not be impeded by stigma or commonly encountered financial/access barriers to mental health services for vulnerable subgroups (e.g., Asians, American Indian or Alaska Native, LGBTQ, and nonconforming youth). Finally, crisis concerns/topics are based on self-report and are not intended to align with ICD-10 diagnosis codes, nor can we determine if increased help-seeking is due to a corresponding increase in acute mental health concerns or awareness of the CTL service. Results from prior studies using CTL data have been validated using emergency department records [35].

This study identified four types of crisis risk profiles in U.S. youth. Membership in more severe risk classes was strongly associated with the pandemic and an increase in suicidal behaviors, particularly among children. Results relying on an LCA perspective highlight that demographic differences in crisis response profiles and suicidal risks may require tailored intervention and prevention programs. Findings may be used by crisis prevention services, like CTL, to triage texters based on latent class profiles, whereby the most experienced crisis counselors can be assigned to texters in the most at-risk classes (D/I/S and S/D). Low-cost and targeted crisis text-based platforms for support-seeking among youth may be one potential safety net strategy to address the significant and persistent effects of the COVID-19 pandemic on mental health in youth and serve as an early warning signal for rising suicidality in young people.

Acknowledgments

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2021.10.003.

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