



Comparisons of mental health symptoms, treatment access, and self-harm behaviors in rural adolescents before and during the COVID-19 pandemic

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Abstract

The COVID-19 pandemic disrupted the lives of adolescents worldwide, and research on the mental health effects are ongoing. Adolescents living in rural areas of the United States were already known to be at a disadvantage in terms of access to mental health services, as well as elevated rates of mental health concerns and self-harm risk. Research on how these factors may have changed since the pandemic began is needed to better understand which areas saw the biggest impact and where we can best direct resources to assist youth. Data from the current study were taken from a project examining adolescent mental health and self-harm risk. The pandemic disrupted the timeline for the study resulting in data being collected in two separate waves: before ($n = 695$) and after ($n = 206$) the pandemic began. Comparisons were made between these two samples on multiple factors including depression, anxiety, emotion dysregulation, alcohol and substance use, experiencing of bullying, overall impairment, mental health services access, and self-harm. Results indicated that adolescents in the pandemic sample were more likely to have seen a counselor and been hospitalized for a mental health reason, and were more likely to have experienced past-year suicide thoughts and plans than adolescents in the pre-pandemic sample. The pandemic sample also showed more depression and anxiety symptoms, greater emotion dysregulation, and greater intensity of recent suicide ideation. Implications for assisting youth through post-pandemic times are discussed.

Keywords Adolescents · Suicide · Self-injury · Mental health · COVID-19 · Rural

Introduction

Since the COVID-19 pandemic began, attention has turned to its psychological consequences in the United States, particularly for youth. Rates of depression, anxiety, and reported distress have increased significantly since before the start of the pandemic, and data on the psychological impact of COVID-19 continues to emerge [1, 2]. Some developing research seems to suggest that COVID-19 and its resulting circumstances pose heightened risk for behaviors and thoughts surrounding suicide, as well as nonsuicidal

self-injury (NSSI) [3, 4]. As suicide and NSSI are associated with stress and uncertainty [5, 6], isolation [7], interpersonal issues [8], and anxiety [9], and COVID-19 has created circumstances that increase the likelihood of those experiences, it is also likely that rates of self-harm will have increased during this time. However, other research suggests there may be protective elements of the pandemic for self-harm behaviors, with some studies reporting decreased rates of suicide and NSSI since the start of the pandemic [10, 11]. For example, lower rates of NSSI and suicide are associated with the presence of family support [12, 13] and less work stress [14]; both of which are circumstances that may be more likely to have occurred during the pandemic. Further, there have been increasing reports of more help-seeking behaviors and treatment access during the start of the pandemic [15], yet it is unclear if this increase is because of growing mental health issues, or because mental health care has, to an extent, become more accessible during the pandemic.

The mental health effects of the pandemic are particularly unclear for adolescents, as few studies have focused

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specifically on this age group [16, 17]. Adolescents are disproportionately affected by suicide and NSSI at the outset [18, 19]; suicide was the 2nd leading cause of death among youth before the start of the pandemic [20], and between 22 and 38% of adolescents report having experienced suicide ideation in their lifetime [21]. In addition, adolescents faced their own unique set of circumstances created by the pandemic, such as online classes, canceled extracurriculars, and isolation from peers. For example, peer relationships become particularly salient during adolescence [8], and with school closures and social distancing, losing access to peers and friends may have significant mental health consequences. While some adults found mental health support more accessible during the pandemic through tele-health availability, youth may have experienced *less* access to support systems through the loss of direct access to teachers and counselors. Thus, rates for self-harm may have increased since the pandemic began. However, there may also be unique protective factors for adolescents, such as the absence of school-related bullying, and more time spent with family members, both of which have been linked to less self-harm thoughts and behaviors [12, 13, 22, 23].

The pandemic could have exacerbated the already established stressors and mental health issues for adolescents in rural areas. Suicide rates for rural-dwelling adolescents are double that of their urban peers, even after accounting for sociodemographic factors [24]. Research has been mixed on rates of suicide ideation, with some finding no differences and some finding higher rates in rural areas [25, 26]. The culture of rural communities could be a contributing factor to increased suicide risk for rural adolescents [24]. They might be less inclined to disclose or identify self-injurious behaviors due to stigma; for example, they were less likely to contact Crisis Text Line for suicide and mental distress in a national sample [27]. In addition, rural adolescents may be more likely to die by suicide from their first attempts. Rates of emergency department visits due to self-harm from self-inflicted gunshot wounds are greater for rural adolescents compared to urban, signaling use of more lethal means within rural contexts [28]. Firearm ownership is high in rural areas [29], and lethal means and firearm safety are essential suicide prevention measures. As the COVID-19 pandemic increased time at home, rural adolescents may have had greater access to firearms. Given the stigma and ease of access, it is plausible that rural adolescents during the COVID-19 pandemic faced increased psychological distress and increased self-harm behaviors.

In addition, common risk factors for suicide have been found to be of great prevalence in rural youth. For example, rural adolescents are more likely to consume alcohol, binge drink, and use illicit substances compared to urban peers [30]. Frequency of alcohol and cannabis use increased following the onset of the pandemic, with peer

relationships and fear of COVID-19 infection associating with substance use [31]. There is also evidence that rural youth experience significantly more bullying compared to urban youth [29]. Experiences of bullying are significantly associated with suicide ideation and planning in this population [32]. However, the increased isolation from peers and school environments due to the pandemic may result in less bullying. Given the high prevalence of risk factors and stigma within rural communities, as well as the increased isolation and reduced access to school supports, it is possible the COVID-19 pandemic exacerbated mental health and self-harm risk.

Of particular concern in addressing mental health and self-harm is accessibility to mental health care in rural areas. Gale and Lambert (2006) [33] identified three components that describe the difficulties of mental health supports within rural communities: accessibility, availability, and acceptability. Rural residents have less accessibility to services, and barriers such as lack of transportation and less mental health literacy and knowledge about options for care. Rural residents have less accessibility to trained mental health professionals, and instead are more likely to be treated by primary care providers for mental health concerns. Even when mental health services are accessible and available, rural residents are less likely to accept care due to stigma. The circumstances of the COVID-19 pandemic may have also created disruptions and closures of in-person treatment facilities, further disadvantaging rural areas which already have fewer facilities in their communities. On the other hand, it is possible that accessibility of mental health services increased via tele-health. For rural areas that have the infrastructure to utilize tele-health services, online therapeutic services provide more support for communities that lack trained mental health professionals without added cost of transportation to in-office visits [34]. Nevertheless, it is clear that rural adolescents are at risk for suicide and other negative mental health outcomes that may be further exacerbated by COVID-19 distress.

Given the relatively new research examining the impact of COVID-19 on adverse psychological outcomes, especially within adolescent samples, the current study aimed to examine whether rates of negative mental health outcomes and positive help-seeking behaviors were different in independent samples of rural adolescents collected before and after the onset of the pandemic. Specifically, we hypothesized there would be differences in suicide ideation, planning, attempts, ideation severity, and NSSI between the two samples. We also examined differences in overall mental health such as depression, anxiety, substance use, alcohol use, emotion dysregulation, and reports of bullying. Lastly, we investigated differences in adolescents' use of mental health services.

Methods

Participants

Participants were 902 high school students recruited from three public high schools in rural areas of the south-central United States. Two high schools were located in a county with communities ranging from a small city to rural farming towns (30–74% of students are economically disadvantaged; 85% of households have internet access and 18.7% are below the poverty level). The third high school was in a county fully designated as rural (overall poverty rate is 18.6%; child poverty rate is 28%; 69% of households have internet access). Participants were part of a longitudinal study of self-harm behavior and were recruited in two waves due to disruptions in the data collection timeline. From 2018 to 2019 (before the COVID pandemic began), 696 participants were recruited into the study, and from 2020 to 2021 (after the COVID pandemic began), an additional 206 participants were recruited. About half of these participants were recruited between September and November 2020, and the other half were recruited between September and November 2021. There were no significant

differences between the before COVID and after COVID samples for mean age, ethnicity (Hispanic vs. Non-Hispanic), or race (White, Black, Native American, Asian, Multi-ethnic, and not specified). There were significant differences between the two samples for gender (lower proportion of males in the after sample) and sexual orientation (greater proportion of gay/lesbian and bisexual participants in the after sample). There were also differences in year in school, with a lower proportion of seniors in the pre-pandemic sample; seniors were not actively recruited in the pre-pandemic sample as the original design was to collect a 6- and 12-month follow-ups (see “[Procedure](#)” for explanation). [Table 1](#) shows a summary of demographic information for both samples.

Measures

Demographics—Participants completed demographic questions on age, grade level, gender, sexual orientation, ethnicity, and if they had seen a counselor (at school or outside of school).

Suicidal Ideation Questionnaire—Junior (SIQ-JR) [[35](#)]. The SIQ-JR is a 15-item self-report measure of an adolescent’s suicide ideation in the past month, designed for use

Table 1 Demographic information and comparisons of samples collected before and after COVID pandemic began

Variable	Pre-pandemic sample (<i>n</i> = 696)	Pandemic sample (<i>n</i> = 206)	<i>t</i> test/ χ^2
Mean age (SD)	15.5 (0.99)	15.6 (1.17)	<i>t</i> (890) = − 1.71, <i>p</i> = 0.09
Gender	%	%	$\chi^2(3) = 15.47$, <i>p</i> = 0.001
Male	44.0	36.9	
Female	54.8	57.8	
Trans identifying	0.4	2.4	
Not specified	0.7	2.9	
Sexual orientation	%	%	$\chi^2(4) = 36.62$, <i>p</i> < 0.001
Heterosexual	88.4	71.6	
Gay/lesbian/homosexual	1.6	4.9	
Bisexual	4.7	12.7	
Not sure	2.9	4.4	
Not specified	2.5	6.4	
School year	%	%	$\chi^2(3) = 61.92$, <i>p</i> < 0.001
Freshman	48.0	46.6	
Sophomore	29.0	23.3	
Junior	21.3	16.0	
Senior	1.5	14.0	
Ethnicity	%	%	$\chi^2(1) = 0.90$, <i>p</i> = 0.34
Hispanic	5.5	7.3	
Non-Hispanic	94.5	92.7	
Race	%	%	$\chi^2(5) = 7.83$, <i>p</i> = 0.17
White/Caucasian	86.0	80.7	
Black/African American	4.0	5.4	
Native American	0.1	0.0	
Asian	3.2	2.0	
Multi-ethnic	5.1	9.4	
Not specified	1.6	2.5	

P-values in bold are significant

with adolescents in grades 7–12. Items are rated according to a 7-point scale ranging from 6 (almost every day) to 0 (I never had this thought). Total scores range from 0 to 90 with higher scores indicating a greater intensity of suicide ideation. Scores of 31 or higher are considered to be above the clinical cutoff indicating greater severity [35]. The SIQ-JR has demonstrated good internal consistency ($\alpha=0.94$ to 0.97), and adequate concurrent and construct validity [36]. Internal consistency in the current study was excellent pre- ($\alpha=0.94$) and post-COVID ($\alpha=0.96$).

Self-injurious thoughts and behaviors interview (SITBI)—Short form [37]. The SITBI-Short Form is a self-report measure assessing the presence, frequency, methods, duration, intensity, and intent of: suicidal ideation, suicidal plans, suicide attempts, and NSSI. Items also measure age of onset, recent thoughts and behaviors, and probability of future behavior. The SITBI has strong reported interrater reliability (average $K=0.99$, $r=1.0$) and test–retest reliability at 6-month follow-up (average $K=0.70$, $ICC=0.44$). The SITBI also correlates strongly with other measures of suicidal ideation and NSSI [37]. For the current study, items assessing past-year occurrence of nonsuicidal self-injury (NSSI), suicide ideation, suicide plans, and suicide attempts were used.

Center for epidemiological studies depression scale for children—(CES-DC) [38]. The CES-DC is a 20-item self-report measure that assesses depressive symptoms in children ages 6 through 17. Higher total scores indicate increasing levels of depression and a clinical cutoff score of 15 identifies children who report clinically significant symptoms [38]. The reliability and validity of the CES-DC has been supported for use with adolescents in the 12–17-year-old range [38]. Internal consistency in the current study was excellent pre- ($\alpha=0.94$) and post-COVID ($\alpha=0.95$).

Beck anxiety inventory—(BAI) [39]. The BAI is a 21-item self-report measure of anxiety symptoms. Although developed for use with adults, the BAI has been widely used in adolescent samples. A validation study of the BAI with an adolescent inpatient sample reported high internal consistency ($\alpha=0.92$) and good test–retest reliability (0.72) [40]. Scores of 26 and higher are considered to be in the severe range of symptoms [39]. In the current study, internal consistency was excellent pre- ($\alpha=0.95$) and post-COVID ($\alpha=0.95$).

Difficulties in emotion regulation scale—(DERS) [41]. The DERS is a 36-item self-report questionnaire that assesses six dimensions of emotion regulation: (1) nonacceptance, (2) goals, (3) impulse, (4) awareness, (5) strategies, and (6) clarity. Items are scored on a 5-point Likert scale; higher scores on each dimension, and the overall total score, indicate greater emotion dysregulation. The initial validation of the DERS showed good internal consistency ($\alpha=0.93$) and test–retest reliability up to 8 weeks [41]. The

DERS has been validated in samples of community adolescents [42, 43] and adolescent inpatients [44]. In the current study, internal consistency for the total score was excellent pre- ($\alpha=0.95$) and post-COVID ($\alpha=0.95$).

Emotion regulation questionnaire for children and adolescents—(ERQ-CA) [45]. The ERQ-CA is an adaptation of the emotion regulation questionnaire (ERQ) originally developed by Gross and John (2003) [46] for use with adults. The ERQ is a 10-item self-report measure that assesses two main ER strategies: cognitive reappraisal (6 items) and expressive repression (4 items). The ERQ-CA includes simplified wording on certain items for a younger audience, as well as a shortened response scale (5-point Likert scale rather than 7-point). Gullone and Taffe (2012) [45] demonstrated sound internal consistency in non-clinical adolescents (α 's = 0.75 to 0.85) and stability over a 12-month period. Internal consistency was good for reappraisal (pre-COVID $\alpha=0.82$, post-COVID $\alpha=0.79$) and suppression (pre-COVID $\alpha=0.73$, post-COVID $\alpha=0.64$).

Alcohol use disorders identification test—(AUDIT) [47]. The AUDIT is a 10-item self-report screening tool with 3 items that assess alcohol consumption and 7 items that assess problems related to drinking. The AUDIT has been validated for use with adolescents between the ages of 13 and 18 [48]. For the current study, responses were coded as yes or no for any alcohol use.

Drug abuse screening test—(DAST-10) [49]. The DAST-10 assesses use and abuse of prescribed or over-the-counter medications, as well as illicit drugs such as cannabis and narcotics. Items also assess problems related to drug use. The DAST-10, with modified language to make all questions relevant to youth, has been found to be a valid and reliable screening tool for substance abuse in adolescents [50]. In the current study, responses were coded as yes or no for any substance use.

Columbia impairment scale—youth version (CIS) [51]. The CIS is a 13-item measure that assesses impairment across a number of domains. Items are rated on a 5-point Likert scale ranging from 0 (no problem) to 4 (very bad problem). Scores of 15 and higher are considered to indicate clinically significant impairment [51]. Internal consistency in the current sample was good (pre-COVID $\alpha=0.85$, post-COVID $\alpha=0.86$).

Procedure

Participants were recruited from three high schools. For the sample recruited before the pandemic began, parent consent forms were distributed to families of all students in grades 9–11 (return rate was 28%). Participants were recruited from these grades so that they would be more likely to complete the baseline assessment, as well as the 6- and 12-month follow-up assessments, according to the

original study design. The pandemic disrupted the timeline of follow-up assessments, and additional recruitment was needed in order to meet ideal sample sizes. Therefore, recruitment of an additional baseline sample of participants after the pandemic began included distributing parent consent forms to all students in grades 9–12. Due to the fluctuating structure of in-person and virtual learning during the pandemic, the return rate of parent consent forms was lower (16% and 17% in 2020 and 2021, respectively). The sample recruited before the pandemic began resulted in 696 participants (88% participation rate), and the sample recruited after the pandemic began resulted in 206 additional participants (43% participation rate for online format in 2020 and 82% participation rate for in person format in 2021). Students who did not participate were either absent on all days of data collection, had moved to a different school, or declined to participate.

For pre-pandemic data collection, the research team made multiple visits to each school to administer the research protocol to participants with parent consent. Participants were gathered in small groups of no more than 10 in the school library or a classroom. Written assent was obtained from each participant, and they alternated between completing paper–pencil self-report measures and some additional measures on an iPad. After completing the research protocol, participants received a debriefing sheet with school and external mental health resources, as well as \$5 in compensation. Before leaving each school on each data collection visit, the research team reviewed all participants' responses on measures of self-harm history to identify those endorsing critical items. Participants who reported recent, frequent thoughts of suicide and/or a recent suicide attempt were referred to school counselors or dedicated crisis counselors at each school. During the pandemic, data collection occurred in two different formats. In the fall of 2020, all participating schools were using hybrid-learning (students attending 2 days a week in person) and visitors were not permitted to the schools. Thus, participants were sent a link to an online version of the research protocol on a secure platform.

A member of the research team checked Qualtrics daily to screen participant responses and make referrals to counselors. In the fall of 2021, schools returned to full-time in-person learning and visitors were permitted. Thus, the data collection procedures were identical to the procedures used before the pandemic began, with the exception of the participants and research team wearing masks. At all stages of data collection, human subjects protection protocols were modified and approved by the authors' Institutional Research Board. All members of the research team completed training on conducting research within COVID safety protocols.

Data analysis plan

To examine differences in treatment access before and during the pandemic, Chi-square analyses were used for items assessing if an adolescent had seen a counselor (yes/no) and if they had been hospitalized for a mental health reason (yes/no). Chi-square analyses were also used to examine differences in rates of bullying, bullying others, alcohol and drug use, and past-year occurrence of suicide ideation, suicide plans, suicide attempts, and NSSI (yes/no for all variables). MANOVA was used to compare scores on suicide ideation severity, anxiety, depression, emotion regulation, and overall impairment between samples collected before and during the pandemic. All analyses were run using SPSS version 27.

Results

Differences in self-harm behaviors

First, rates of suicide ideation, plans, and attempts were compared in the pre-pandemic and pandemic samples; rates of suicide ideation and suicide plans were significantly different, but suicide attempts were not. For past-year suicide ideation, pre-pandemic rates were 14.5 vs. 27.7% during the pandemic, $\chi^2(1) = 19.05, p < 0.001$. For past-year suicide plans, pre-pandemic rates were 4 vs. 7.8% during the pandemic, $\chi^2(1) = 4.80, p < 0.05$. For past-year suicide attempts, overall rates were low: 1.7% pre-pandemic vs. 3.9% during the pandemic, $\chi^2(1) = 3.42, p = 0.06$. For past-year NSSI, rates before (7.5%) and during the pandemic (11.7%) did not reach statistical significance, $\chi^2(1) = 3.60, p = 0.06$. When comparing adolescents who participated in our study before and after the pandemic began on suicide ideation severity, MANOVA analyses results found significantly higher mean scores in the pandemic group than in the pre-pandemic group (see Table 2).

Differences in mental health symptoms

Rates for being bullied, or bullying others, were not significantly different for before and after pandemic samples (16 vs. 19.5% for being bullied; 4.2 vs. 3.4% for bullying others, respectively). Rates of alcohol and drug use were also not significantly different for before and after pandemic samples (15 vs. 17% for alcohol use; 7.6 vs. 12.2% for drug use, respectively). Results from the MANOVA analysis showed significant differences between pre-pandemic and pandemic samples on anxiety symptoms, depression symptoms, the emotion regulation strategies of reappraisal and suppression, overall difficulty with emotion regulation, and overall impairment. For all of the variables, scores from the

pandemic sample were indicative of significantly greater mental health symptoms, impairment, emotion regulation difficulties (see Table 2).

Differences in accessing mental health treatment

Adolescents were more likely to have seen any type of counselor (at school or outside of school) in the pandemic sample (54.4%) compared to pre-pandemic (44.2%), $\chi^2(1) = 6.66$, $p < 0.01$. Hospitalizations for mental health reasons were also more frequent in the pandemic sample (14.4%) compared to pre-pandemic (6.7%), $\chi^2(1) = 9.95$, $p < 0.01$.

Exploratory analyses for clinical severity

Chi-square analyses were also used to compare the proportion of adolescents who scored above and below the clinical cutoffs for the measures assessing recent suicide ideation severity, depression, anxiety, and impairment. For suicide ideation severity, the proportion of adolescents scoring above the clinical cutoff was significantly higher in the pandemic sample (11.6%) compared to the pre-pandemic sample (2.8%), $\chi^2(1) = 24.15$, $p < 0.001$. For anxiety symptoms, the proportion of adolescents scoring in the severe range for symptoms was also significantly higher in the pandemic sample (27.7%) compared to the pre-pandemic sample (16.3%), $\chi^2(1) = 12.68$, $p < 0.001$. Similar results were found for depression symptoms, with significant differences in the proportion of adolescents scoring above the clinical cutoff pre-pandemic (43.7%) compared to during the pandemic (63.6%), $\chi^2(1) = 23.96$, $p < 0.001$. For overall impairment, while significant differences were found for mean scores in the pre-pandemic and pandemic samples, proportions of adolescents scoring above the clinical cutoff did not significantly differ (36.7 vs. 40.1%, respectively), $\chi^2(1) = 0.71$, $p = 0.40$.

Table 2 Mean differences in mental health symptoms and suicide ideation in samples of adolescents from before and after COVID pandemic began

Variable	Pre-pandemic sample (<i>n</i> = 696)	Pandemic sample (<i>n</i> = 206)	<i>F</i> test
Suicide ideation severity	6.01 (10.12)	11.39 (15.32)	31.60**
Anxiety symptoms	11.89 (12.79)	17.03 (15.02)	21.99**
Depression symptoms	16.60 (13.00)	23.12 (15.09)	35.34**
Reappraisal	27.40 (7.45)	25.32 (6.98)	12.16**
Emotion suppression	15.77 (5.52)	17.49 (5.01)	15.28**
Difficulty in emotion regulation	82.59 (26.60)	94.16 (29.51)	26.07**
Impairment	12.16 (9.85)	14.36 (10.54)	7.14**

** $p < 0.001$

Discussion

The data from this study that was already in progress when the COVID-19 pandemic began provided the opportunity to examine how adolescents were impacted by the pandemic in terms of mental health symptoms, suicide risk, and accessing services. In this sample of adolescents from rural schools in the south-central region of the United States, there is evidence of the far-reaching effects of the pandemic on youth. Many aspects of mental health seem to have been impacted by the pandemic and the subsequent challenges that adolescents endured. In this cross-sectional comparison of two samples of adolescents, one surveyed before the pandemic began and one surveyed after it began, there were significant differences in symptoms of depression, anxiety, overall impairment, emotion regulation difficulties, and suicide ideation and plans.

Not only were mean scores on mental health symptom measures significantly higher in the sample collected after the pandemic began, but the proportion of adolescents scoring above the clinical cutoffs on these measures were also significantly higher in the pandemic sample. It is striking how the majority of the this sample (almost 64%) reported clinically significant symptoms of depression and almost 28% reported severe anxiety symptoms. The rates in our pandemic sample are much higher than rates of clinically significant anxiety (11.6%) and depression (12.9%) in youth from other studies prior to the pandemic, and even higher than pooled prevalence estimates of these rates in youth since the pandemic began (25.2% depression, 20.5% anxiety) [52]. Our results are also in line with other research that has compared pre- and post-COVID mental health in adolescents, including prior work that also found emotion dysregulation to be impacted and to be associated with sustained negative effects [53]. Thus, this study provides additional evidence that mental health symptoms may be increasing in adolescents, and at the same time, they appear to have fewer coping and emotion regulation skills to manage those symptoms. Adolescents have undoubtedly felt the effects of a period in time characterized by intense uncertainty, disruptions in routines, schooling, and social interaction, fear of illness, and loss of family members and friends to COVID in some circumstances.

In addition to greater depression, anxiety, and difficulties in emotion regulation for youth in the pandemic sample, differences for some facets of self-harm were also found. The proportion of adolescents reporting any thoughts of suicide within the past year was significantly different between the two samples of youth, with 14.5% reporting ideation pre-pandemic and almost 28% reporting ideation during the pandemic. In addition to the difference

in rates of occurrence of suicide ideation, overall suicide ideation severity within the past month was significantly different, with greater severity observed in the pandemic sample. Moreover, the proportion of adolescents scoring above the clinical cutoff on the suicide ideation measure was significantly higher in the pandemic sample. Almost 3% were above the cutoff in the pre-pandemic sample, and 11.6% were above the cutoff in the pandemic sample. Previous studies using the same measure in high school settings in southern regions of the United States generally report that 2–3% of adolescents endorse clinically significant suicide ideation severity [54], so a notable proportion of higher severity was seen in our pandemic sample. Similarly, the proportion of adolescents reporting any suicide plan within the past year was significantly higher in the pandemic (7.8%) compared to pre-pandemic (4%). While differences were seen for suicide thoughts and plans, there were not corresponding differences in self-harm behavior. Rates of past-year suicide attempts did differ (1.7% and 3.9% in pre-pandemic and pandemic samples, respectively), as did rates of NSSI (7.5% and 11.7%, respectively), but neither of these reached statistical significance ($p=0.06$ for both). The overall pattern of results indicates that a greater proportion of adolescents experienced thoughts of suicide, with some also having specific plans, but that proportions of actual self-harm behavior were not different. It may be that the stress of the pandemic, along with increased mental health symptoms and emotion dysregulation, occurred concurrently with increases in suicide thoughts and plans. However, perhaps life circumstances for many adolescents in our sample during the pandemic provided more family support and supervision, which could have resulted in no significant differences in self-harm behavior.

Another explanation for differences in self-harm thoughts but not behaviors could be due to the fact that more youth accessed mental health services in the pandemic sample. More than half of this sample (54.4%) reported seeing a counselor compared to 44.2% of the pre-pandemic sample. Similarly, more students reported being hospitalized for mental health reasons in the pandemic sample. These results could indicate that even though adolescents appear to be struggling more with mental health symptoms and suicide thoughts since the pandemic began, they are more likely to access mental health resources. This increase in accessibility could be due to more parent supervision, teachers and counselors being more attentive to students who are struggling, and/or adolescents being more willing to reach out for help when they are distressed. This increase may also be a result of growing online mental health services, which may work to reduce barriers for adolescents specifically in rural populations, such as travel to appointments, expense of traditional care, availability of appointments, and lack of anonymity.

Thus, online mental health services may be accounting for the difficulties described by Gale and Lambert (2006) [33], namely accessibility, availability, and acceptability, and providing more options for rural adolescent residents that were unavailable pre-pandemic. However, it is also important to note that adolescents in rural settings may have more difficulty maintaining consistent internet connection or obtaining access to technological resources than adolescents in more urban areas; future research investigating the effect of the pandemic on rural vs. urban adolescents' access to mental health services may help clinicians better understand how to provide support for both groups more effectively.

Limitations of our study should also be noted. Our comparisons of samples collected before and after the pandemic began on mental health and suicide risk were based on cross-sectional data; we cannot make conclusions about how the pandemic affected the same sample of students as they experienced it. Hopefully, future studies are able to provide longitudinal data for youth to better understand how adolescents were impacted across time. All our data were from self-report measures and are, therefore, from the perspective of the adolescents. Future research would benefit from also surveying teachers and parents of adolescents to provide additional perspectives, and to also gain understanding about how the school and home contexts relate to mental health and suicide risk. Lastly, data collected during the pandemic occurred in different formats to work within the school's COVID policies and procedures, resulting in both online and in-person data collection. This may have affected responses in the pandemic sample, and future research can aim for uniform data collection, while still acknowledging that the course of the pandemic is unpredictable.

Within the United States, there have been recent reports highlighting the mental health crisis facing youth in the country [55]. Our data seem to reflect the trends being reported nationwide, with relatively high levels of anxiety, depression, and suicide ideation in the adolescents assessed after the pandemic began. Overall, the COVID-19 pandemic seems to have contributed to negative mental health outcomes for adolescents. While access to mental health services in our pandemic sample was higher than pre-pandemic, many studies and reports repeatedly note that most adolescents with mental health issues either do not seek services or are unable to obtain them [56]. Having access to health insurance that includes coverage for mental health services, and access to both healthcare and mental health providers are established protective factors for youth self-harm [57, 58]. In addition, emotion regulation skills, having supportive family members, and having a supportive school environment are protective for youth self-harm [8]. As we move forward towards the recovery phase of the pandemic, there are several steps that can be taken to assist youth who have been negatively impacted. At a policy level, legislative bodies

can prioritize funding and resources for schools and mental health treatment. Many schools are implementing social-emotional learning curricula, and continued support of these efforts will help adolescents gain much-needed emotion regulation and coping skills. Schools and communities are also in need of increased access to mental health services; funds to hire more clinicians and provide training on evidence-based practices for self-harm risk would be beneficial. Recovery from the pandemic will be a slow and steady process, but focusing our efforts on supporting youth, their families, and their communities will ensure that youth receive the care they need.

Results from our study point to the need for immediate and future clinical focus to be directed towards providing extra supports for adolescents as the world begins to recover from the pandemic. When integrating back into school and normal routines, adolescents may need more support from guidance counselors and outside resources than they did pre-pandemic. Rural adolescents are particularly underserved in the mental health field, yet current findings suggest they are suffering significant mental health consequences from the pandemic. However, as the current study found that self-harming *behaviors* were not different in rural adolescents before and after the pandemic began, it may be due to increased access to support services that were available during the pandemic, such as online mental health treatment and more time spent with family. Future clinical work should consider how to continue to provide greater accessibility to rural adolescents at risk for self-harm behavior.

Conclusion

Overall, the current study emphasizes the concerning trend of increased mental health crises within adolescents in the United States. Further, results provide further support for the struggles faced by adolescents since the pandemic began. Adolescents surveyed during the pandemic reported greater distress and impairment as well as clinically significant symptoms of depression, anxiety, suicide ideation, and suicide plans in adolescents. Despite the negative psychological impacts, a greater proportion of adolescents accessed mental health access after the onset of the pandemic and reports of suicide attempts did not differ before and after the pandemic. It is possible the pandemic provided more access to mental health services to those in rural environments via tele-health services. In addition, more time with family and attentive school staff could have helped negate the transition from thoughts of self-harm to self-harm behaviors. Future research should continue examine the consequences of the COVID-19 pandemic within adolescents, specifically those in rural environments.

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Data availability Data used in this study are available through the NIMH Data Archive (collection #2972).

Declarations

Conflict of interest The authors have no conflicts of interest to declare that are relevant to the content of this article.

Ethical approval The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Informed consent Written informed consent was obtained from parents or legal guardians, and written assent was obtained from all adolescent participants.

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