



Research Article

Substance Use and Mental Health Responses to COVID-19 among Rural Adolescents

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Citation: Monico LB, O'Grady KE, Gryczynski J, Garrison K, Ross T, et al. (2023) Substance Use and Mental Health Responses to COVID-19 Among Rural Adolescents. Arch Pediatr 8: 274. DOI: 10.29011/2575-825X.100274

Received Date: 19 June 2023; **Accepted Date:** 27 June 2023; **Published Date:** 30 June 2023.

Abstract

Purpose: This analysis provides a cross-sectional examination of adolescent mental health and substance use, to explore whether COVID-19 related stressors had an impact on substance use. **Methods:** This analysis examines data from 249 adolescents (aged 12-17 years) gathered between April 2020-April 2021. Adolescents completed a one-time survey assessing COVID-19-related stressors (CDC COVID-19 question bank), anxiety (GAD-7), depression (PHQ-9), and substance use (ASSIST). COVID-19-related items were categorized to create five indices of the Pandemic Response Index (PRI): Positive Actions, Negative Actions, Antisocial Behavior, Family Conflict, and Family Stress. Four logistic regression analyses were conducted for each substance use dependent variable (tobacco/alcohol/marijuana/any substance), with predictor variables including: 5 covariates (state, age, sex, race, and ethnicity) and 7 explanatory variables (PHQ-9 and GAD-7 scores, and the 5 Pandemic Response Indices scores). **Results:** Overall rates of anxiety and depression were high in the sample. For the PRI, Negative Actions (aOR=1.67 [1.06, 2.61]) and Antisocial Behavior (aOR=1.31 [1.06, 1.63]) indices were significantly associated with alcohol use, while Family Stress was associated with tobacco use (aOR=2.08 [1.31, 3.30]) and any substance use (aOR=1.58 [1.08, 2.29]). Across each of the models, the only significant preventive relationship from the PRI was Positive Action (aOR=0.63 [0.34, 0.89]), which was associated with decreased likelihood of tobacco use. **Conclusion:** This study found an association between some COVID-19 stressors and adolescent substance use behaviors. Self-reported anxiety and depression in this sample are concerning, but were not independently associated with substance use.

Keywords: Adolescent; COVID-19; Rural; Substance use; Anxiety; Depression

Introduction

Adolescents represent a vulnerable population and required unique consideration for behavioral and mental health support through the COVID-19 pandemic-related lockdowns [1,2]. The loss of structural support provided by daily activities and connections with other youth and adults outside of the home, as well as school, sports, church, and other social activities placed adolescents in a particularly vulnerable position during this period.

The number of adolescents surrounded by dysfunctional family dynamics are of concern, and the impact of pandemic-related lockdowns on adolescents is not yet fully understood [2].

Recent studies have examined the impacts of loneliness as a result of enforced isolation due to previous disease outbreaks and pandemics, and their association with increased mental health concerns among children and adolescents [3]. Kilinçel and colleagues [4] found a positive correlation between loneliness and anxiety during COVID-19 related isolation as a result of societal lockdowns. COVID-19-related home confinement is also associated with increased interfamilial violence, with particular

vulnerabilities for adolescents and children, especially adolescent girls [1,2]. Families experiencing financial difficulties, loss of access to food or healthcare, or those with a history of domestic violence, abuse, or neglect are at heightened risk for violence and mental health concerns [5,2].

One recent systematic review found that the COVID-19 pandemic impacted adolescent mental health, and lockdowns were associated with increases in anxiety and depression [6]. This literature begins to suggest that increased mental health concerns could be associated with loss of emotional connections, conflict with friends, and social distancing motivations [7,8]. Evidence related to increased time with family is mixed, with some positive impacts due to increased support [9], but some negative impacts related to family conflict and violence, such as depression, loneliness, and an overall decrease in mental health and wellbeing [10-13].

Early life stress, social isolation, and boredom are known risk factors for substance use [5,14]. Two studies that assessed mental health and substance use found that participants were initiating or increasing substance use to cope with COVID-19-related stress and fears [15,9]. Higher prevalence of substance use was particularly acute among young people (aged 18-24) and Hispanic participants. One Canadian study, using a convenience sample with limited generalizability, found concerning rates of adolescents meeting clinical cutoffs for depression, anxiety, and post-traumatic stress disorder, substance use, and, substance use co-occurring with mental health during quarantine periods [16].

The purpose of this analysis is to provide a cross-sectional examination of adolescent mental health and substance use in the US, and determine whether COVID-19 related stressors and lockdowns had an impact on adolescent substance use.

Methods

Parent Study

To gather the data for this analysis, we leveraged an ongoing study that was disrupted by the COVID-19 pandemic – restricting the analysis to individuals who would be eligible to complete a long-term follow-up survey during the year following the COVID-19 pandemic onset. The parent study aimed to assess the effectiveness of a Screening, Brief Intervention, and Referral to Treatment (SBIRT) package specifically for adolescent patients in primary care settings. Research was conducted at large, rural Federally Qualified Health Centers (FQHCs) in New Mexico and Tennessee. All adolescents ages 12 to 17 with an appointment to see a primary care provider within these clinics were approached to participate from April 2018-March 2020. Recruited participants

were screened for substance use and mental health in the past 3- and 12-months, and completed follow-up surveys at 3-months. The intervention was not shown to reduce substance use and therefore should not confound the current analysis. The parent study was IRB approved by Western Institutional Review Board (WIRB). IRB approval was subsequently obtained for a study modification due to adjustments for the COVID-19 pandemic that included adding a 20-minute, 12-month follow-up survey.

Recruitment

A total of 1,130 unique participants were recruited into the parent study, across 1,239 participant visits. Participants were eligible to re-enroll in the study after 12 months had passed since their last recruitment to track longitudinal change. Based on their baseline recruitment date, 611 of those unique participants were initially eligible for the 12-month follow-up. Sixty (60) participants indicated on their consent document that they did not want to be contacted for future studies, or withdrew from the parent study. Twenty-four (24) participants timed out of their 12-month follow-up window before IRB approval was obtained. The final subsample of eligible participants for the current analysis was 527, but only 339 individuals responded to the 12-month survey. Once duplicate enrollments in the parent study were removed and listwise deletion performed for all surveys with missing data, the final sample for this analysis was 249.

Measures

Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST)

Substance use history was obtained through Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST). The ASSIST screens for lifetime use for a wide range of substances, and positive responses prompt frequency and life impact questions for the previous 3 months, as well as an additional question regarding injection use as a route of administration [17,18].

In the case of the present study, we followed the scoring procedure for the ASSIST used in the parent study, whereby ASSIST scores were collapsed into binary categories of use vs. non-use for each substance (tobacco, alcohol, marijuana) due to a limited range of non-zero scores. Most adolescents in the primary care sample of the parent study reported no lifetime use of some or all of these substances, and only those participants who report previous lifetime use are asked questions regarding frequency or use in the previous 3 months. Therefore, the variability among responses for frequency of use in the previous 3 months was too great and required that these responses be collapsed into dichotomous responses of use versus non-use in the previous 3 months.

Depression

Depression levels were measured through the Patient Health Questionnaire-9 (PHQ-9) [19]. The PHQ-9 is a 9-item screening tool with four Likert scale response categories that are scored from 0 to +3. Scores ≤ 4 are considered minimal to no depressive symptoms, scores 5-14 (inclusive) are considered mild-moderate symptoms, and scores greater than 15 are considered moderate-severe symptoms. The maximum score on the PHQ-9 is 27.

Anxiety

Anxiety levels were measured through the Generalized Anxiety Disorder-7 (GAD-7) [20]. The GAD-7 is a 7-item screening tool with four Likert scale response categories that are scored from 0 to +3. Scores of 5, 10, and 15 represent respective cut-points for mild, moderate, and severe symptoms of anxiety. The maximum score of the GAD-7 is 21. For the 12-month survey, participant anxiety and depression were assessed from the benchmark of March 1st, 2020, the beginning of the pandemic and pandemic-related lockdowns. This ensured that all participants were reflecting on the same period, regardless of when the participants were completing their 12-month survey.

Pandemic Response Indices

CDC COVID-19 Community Survey Question Bank. COVID-19 impact was measured through a version of the CDC COVID-19 Community Survey Question Bank that was modified to make the questions more appropriate for adolescents. These questions measured COVID-19 related stress and life impact through asking about their and their family's stress, COVID-19 exposure, financial impacts, school delivery, and various coping strategies. Adherence to lockdown guidelines were also measured through items targeting various activities in which the adolescents participated, and their attitudes toward state lockdown guidelines.

PRI Development Process

We revised the CDC COVID-19 Community Survey Question Bank to be suitable for use with adolescents (see Appendix A). For this analysis, we reference the version of this question bank that was publicly available as of March, 2020. The research team pulled all questions from the survey bank that would be applicable to adolescents already enrolled in the study, and reviewed and revised question wording to be understandable for adolescents ages 12-17. Ultimately, the measure was finalized with 14 items.

More specifically, adolescents were asked whether they knew someone who had tested positive for COVID-19, if lockdowns created stress for the adolescent and their family, if lockdowns caused the adolescent to miss activities, the status of their schooling (in-person vs. virtual), the employment status of

the adolescent's parents, if the adolescent's family had encountered a shortage of resources (money, food, lodging, etc.), what coping behaviors the adolescent had engaged in since the onset of the pandemic, if family conflict and violence had increased since the onset of the pandemic, self-reported feelings of safety, whether adolescent's engaged in specific activities during the lockdowns (going to a restaurant, store, church, friend's house, gathering of 10+ people, etc.), and the adolescent's attitudes toward pandemic related lockdowns.

We reviewed our questionnaire to determine what substantive areas of personal, family, and community response to the COVID-19 crisis could be measured, based on the question content. The questionnaire was independently reviewed by two of the authors with an attempt to identify questions that reflect substantive areas of interest. Five areas were independently identified, and suitable questions were independently chosen to measure behavior in each area. This decision was independently reviewed and affirmed by the remaining authors. This review took place without any review of the participant data collected in response to the COVID-19 questionnaire.

After review, we developed 5 indices that measured 5 discrete areas of functioning that might be related to participants' substance use (see Appendix A): Positive Actions (6 questions: 9a, 9b, 9c, 9d, 9e, 9f), defined as self-reported behaviors that a participant could take during lockdown that were behaviors considered to be adaptive; Negative Actions (5 questions: 9l, 9m, 9n, 9o, 9p), defined as behaviors considered to be maladaptive or self-defeating; Antisocial Behavior (8 questions: 12a, 12b, 12c, 12d, 12e, 12f, 12g, 12h), defined as behaviors that would likely expose the respondent, and, if the respondent was COVID-positive, to an increased likelihood of COVID-19 infection; Family Conflict (5 questions: 10a, 10b, 10c, 10d, 10e), defined as a measure of discord within the family unit; and Family Stress (4 questions: 8a, 8b, 8c, 8d), defined as environmental stressors (lack of money to pay for necessities, homelessness) that impacted the family unit. Scoring for each question was binary, with a 0 for a no response, and 1 for a yes response, with the sum of the item scores for each of the 5 indices ranging from 0 to the number of questions in the respective index.

Other Variables

State (New Mexico vs. Tennessee) in which the participants were recruited, and participant age, sex (male vs. female), race (White vs. non-White; Due to the small sample size, the categories American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, and Black or African American were combined to form a single non-White group), and ethnicity (Hispanic/Latinx vs. a combined non-Hispanic or Latino and Unknown/Refused to Answer group) were included as covariates

in the analyses.

Statistical Analysis

Four separate logistic regression analyses were conducted, one for each of the substance use measures, each assumed to follow a binomial distribution. The predictor variables in these analyses were: the 5 covariates (state, age, sex, race, and ethnicity) and the 7 explanatory variables (PHQ-9 and GAD-7 scores, and the 5 Pandemic Response Indices scores). Lack of fit of the respective model was tested with the information matrix, Osius and Rojak, and Stukel tests [21,22,23]. Model fit was estimated with Tjur’s R2 [24], a measure of discrimination provided by the specified model relative to a null model (a model including only the intercept) that falls within (0,1) bounds. Interpretation of findings for categorical explanatory variables focused on least squares means (Ms) and their respective standard errors (SEs). These least squares means can be considered model-derived predicted probabilities of occurrence of the binary event outcome. Interpretation for continuous explanatory variables focused on the adjusted odds ratio (aOR) and its 95% confidence interval. Given that the units of measurement for the PRI variables were arbitrary (as opposed to age, where a 1-unit change means a 1-year change), changes in the aOR for the PRIs were determined for each one standard deviation (SD) change in the respective PRI (rather than in terms of a 1-unit change). Parameter estimates are reported only for significant explanatory variables. The Type I error rate for all tests of significance was set at .05. SAS 9.4M6 was used to conduct all analyses.

Results

Participants

(Table 1) reports background information regarding the sample, which was approximately 14 years of age, with somewhat more females than males, majority White, with one-third of the sample indicating Hispanic/Latinx ethnicity. The mean score for the PHQ-A indicated the sample as a whole was experiencing recent mild depressive symptoms. Examination of the range of scores, and using cut points established for adults, revealed that 54% of the participants self-reported symptoms consistent with minimal to no depression, 23% mild depression, 11% moderate depression, 6% moderately severe depression, and 5% severe depression in the two weeks prior to scale administration. The GAD-7 mean score indicated the sample as a whole was experiencing some recent symptoms of anxiety. Examination of the range of scores, and again using cut points established for adults, revealed that 64% of the participants self-reported symptoms consistent with minimal to no anxiety, 20% mild anxiety, 8% moderate anxiety, and 7% severe anxiety in the two weeks prior to scale administration. Regarding substance use, more than 60% of the sample indicated no lifetime use of psychoactive substance use, with 25% of the

sample indicating past 3-month use of tobacco and/or alcohol and/or marijuana.

State [n(%)]	
New Mexico	112 (45%)
Tennessee	137 (55%)
Demographics	
Age [Mean (SD)]	14.2 (1.8)
Sex [n (%)]	
Female	151 (61%)
Male	98 (39%)
Race [n (%)]	
American Indian or Alaskan Native	7 (3%)
Native Hawaiian or Other Pacific Islander	1 (1%)
Asian	2 (1%)
Black or African American	3 (1%)
White	175 (70%)
More than One Race	23 (9%)
Unknown/Refused to answer	38 (15%)
Hispanic [n (%)]	
Hispanic or Latinx	81 (33%)
non-Hispanic or Latinx	156 (63%)
Unknown/Refused to answer	12 (5%)
ASSIST Lifetime Score [Mean (SD)]	0.8 (1.1)
ASSIST Lifetime Binary	
No Lifetime Use of Any Substance	154 (62%)
Lifetime Use of one or More Substances	95 (38%)
Depression and Anxiety	
PHQ-A [Mean (SD)]	5.7 (6.3)
GAD-7 [Mean (SD)]	4.2 (5.3)
Pandemic Response Index [Mean (SD)]	
Positive Actions	3.8 (1.5)
Negative Actions	1.2 (0.9)
Antisocial Behavior	3.0 (1.9)
Family Conflict	0.8 (1.0)
Family Stress	0.4 (0.8)
Past 3-month Substance Use [n (%)]	
Tobacco	29 (12%)
Alcohol	44 (18%)
Marijuana	31 (12%)
Any Substance Use	61 (25%)

Table 1: Descriptive Statistics for Demographics, Depression and Anxiety, Pandemic Response Indices, and Past 3-month Tobacco, Alcohol, Marijuana, and Any Substance Use (N=249); PHQ-A = Patient Health Questionnaire – Adolescent version. GAD-7 = Generalized Anxiety Disorder-7 questionnaire. ASSIST = Alcohol, Smoking and Substance Involvement Screening Test. The ASSIST

Lifetime Score is the score in response to Q1 (“In your life, which of the following substances have you ever used”) with a theoretical range of scores between 0 and 30, inclusive. The theoretical range of PHQ-A scores is 0-27, inclusive. The theoretical range of GAD-7 scores is 0-21, inclusive. The theoretical range of scores for the Pandemic Response Indices were: 0-6, inclusive, for Positive Actions; 0-4, inclusive, for Negative Actions; 0-5, inclusive, for Family Conflict; 0-4, inclusive, for Family Stress; and 0-8, inclusive for Antisocial Behavior. (See text for further details regarding the 5 Pandemic Response Indices.) The respective past-3-month use item from the ASSIST was scored as non-use (=0) versus any use (=1). Any use was defined as use of tobacco, and/or alcohol and/or marijuana or otherwise, non-use. Percentages within a particular category do not necessarily sum to 100% due to rounding.

Statistical Models

All lack-of-fit statistics were nonsignificant ($p > .05$) in all 4 analyses, suggesting no reason to believe there was a lack of fit of any of the 4 models to the data. Each of the logistic regressions presented below were used to explore the cross-sectional associations between reported experiences and adaptations during the COVID-19 pandemic and depression, anxiety, and substance use (tobacco, alcohol, marijuana, or any substance) during the 12 months following the onset of the pandemic.

Tobacco Use

Tjur’s R^2 indicated that the model explained 27.1% of use versus non-use of tobacco. There were 4 significant predictors

of tobacco use (Table 2). Although males and females reported low levels of tobacco use, males were three times more likely on average than females to smoke. The odds of tobacco use increased 98% with each 1-year increase in age. The odds of tobacco use decreased 50% with each 1 SD increase in PRI-Positive Action score, and increased 82% with each 1 SD increase in PRI-Family Stress score.

Alcohol Use

Tjur’s R^2 indicated that the model explained 19.5% of use versus non-use of alcohol. There were 4 significant predictors of alcohol use (see Table 2). Participants in New Mexico were more than twice as likely on average than participants in Tennessee to use alcohol. The odds of alcohol use increased 62% with each 1-year increase in age, increased 60% with each 1 SD increase in PRI-Negative Actions score, and increased 67% with each 1 SD increase in PRI-Antisocial Behavior score.

Marijuana Use

Tjur’s R^2 indicated that the model explained 13.1% of use versus non-use of marijuana. There was 1 significant predictor of marijuana use (see Table 2), wherein the odds of marijuana use increased 151% with each 1-year increase in age.

Any Substance Use

Tjur’s R^2 indicated that the model explained 23.6% of use versus non-use of any substance. There were 2 significant predictors of any substance use (Table 2). The odds of use of any substance increased 72% with

	Tobacco			Alcohol			Marijuana			Any Substance use		
	Wald χ^2	<i>p</i>	Parameter Estimates	Wald	<i>p</i>	Parameter Estimates	Wald	<i>p</i>	Parameter Estimates	Wald	<i>p</i>	Parameter Estimates
State	0.1	.79		4.6	.031	New Mexico <i>M</i> =0.18 (.04) Tennessee <i>M</i> =0.07 (.03)	2.3	.13		1.0	.32	
Sex	4.3	.037	Male <i>M</i> =.06 (.03) Female <i>M</i> =.02 (.03)	0.9	.34		0.2	.67		0.7	.41	
Race	1.8	.17		1.5	.22		0.1	.82		0.0	.93	
Hispanic	0.2	.65		0.4	.53		0.0	.90		0.1	.77	
Age	17.6	<.001	<i>aOR</i> =1.98 (1.43, 2.72)	16.9	<.001	<i>aOR</i> =1.62 (1.29, 2.04)	15.2	<.001	<i>aOR</i> =1.68 (1.29, 2.18)	25.9	<.001	<i>aOR</i> =1.72 (1.40, 2.12)
PHQ-A	0.0	.96		0.0	.86		0.4	.55		0.1	.82	
GAD-7	0.1	.72		0.1	.73		0.7	.41		0.2	.68	
PRI: Positive Actions	7.0	<.001	<i>aOR</i> =0.63 (0.34, 0.89)	0.0	.98		0.0	.85		1.1	.30	
PRI: Negative Actions	0.0	.98		5.0	.026	<i>aOR</i> =1.67 (1.06, 2.61)	0.2	.65		0.7	.40	
PRI: Antisocial Behavior	0.5	.49		6.3	.011	<i>aOR</i> =1.31 (1.06, 1.63)	1.2	.27		0.5	.49	
PRI: Family Conflict	1.0	.32		0.2	.63		0.1	.81		0.1	.82	
PRI: Family Stress	9.5	.002	<i>aOR</i> =2.08 (1.31, 3.30)	0.3	.56		1.5	.22		8.2	.004	<i>aOR</i> =1.58 (1.08, 2.29)

Table 2: Wald χ^2 Tests of Significance, *p* values, and Parameter Estimates for the Explanatory Variables in the 4 Logistic Regression Models Predicting ASSIST 3-month Tobacco, Alcohol, Marijuana, and Any Substance Use during the COVID-19 pandemic (*N*=249); PHQ-A = Patient Health Questionnaire – Adolescent version. GAD-7 = Generalized Anxiety Disorder-7 questionnaire. ASSIST = Alcohol, Smoking and Substance Involvement Screening Test. PRI = Pandemic Response Index. (See text for further details regarding the 5 Pandemic Response Indices.) The tobacco, alcohol, and marijuana past-3-month use item from the ASSIST was scored as non-use (=0) versus any use (=1); any use was scored as non-use (=0) versus any use (=1) for any one or more of these three substances. *aOR* = adjusted odds ratio (95% confidence interval). *M* = least squares mean (standard error). *df*=1 for all Wald χ^2 tests of significance.

Discussion

This analysis of data collected from a sample of adolescent primary care participants found concerning levels of anxiety, depression, and substance use during the first year of the COVID-19 pandemic. The purpose of this analysis was to explore overall screening results for anxiety and depression, as well as associations between the ways in which adolescents’ lives had been affected by the pandemic and reported substance use.

Overall, the sample reported experiencing recent depressive symptoms, with nearly half expressing at least mild depressive symptoms, and just over 1 in 10 reporting they experienced severe depressive symptoms. Regarding anxiety, the sample reported experiencing recent symptoms of anxiety, but at slightly lesser rates than depression. Just over a third of participants indicated experiencing at least mild anxiety symptoms within the 2 weeks leading up to their 12-month follow-up, with just over 1 in 14 expressing severe anxiety symptoms.

After two years of living through the COVID-19 pandemic, researchers are still struggling to understand the mental health impact on adolescents. Given the association between the long-term effects of mental health disorders on everything from substance use to poor physiological health outcomes [25,26] the toll of the pandemic poses an even greater challenge for adolescents who do not have the psychological coping and resiliency of their adult counterparts [27]. Overall, our results lend some support the handful of recently published studies related to adolescent mental health and the COVID-19 pandemic, characterizing adolescents’ substance use, anxiety, and depression during the pandemic.

The results of this analysis presented findings that linked specific ways in which the COVID-19 pandemic changed the daily lives of this adolescent sample with the likelihood of also reporting substance use. By categorizing specific items from the CDC COVID-19 Community Survey Question Bank, we created the PRI to measure Positive Actions, Negative Actions, Antisocial Behavior, Family Conflict, and Family Stress. We then used these categorizations to determine if there was an association between these measures and tobacco, alcohol, marijuana, or any substance use. Unsurprisingly, age was a significant predictor of an increased likelihood of use during the first year of the pandemic for all substances, with older adolescents more likely to report using any substance. For the PRI, Negative Actions and Antisocial Behavior indices were significantly associated with alcohol use, while Family Stress was associated with tobacco use and any substance use. Across each of the models, the only significant preventive relationship from the PRI was Positive Action, which was associated with decreased likelihood of tobacco use.

Similar to mental health concerns, research is still ongoing to fully understand the relationship of the COVID-19 pandemic

with adolescent substance use [28]. Remote schooling reduced the amount of regular interactions with peers and engaging in extracurricular activities, clubs, and sports, at a time when many adolescents have grown accustomed to spending large amounts of time with other non-family members. Hypotheses surrounding this as a preventative or risk factor remain mixed, but there is ongoing concern about whether this impediment to independence and the individuation process will create favorable conditions for initiating substance use among adolescents [29].

It is worth highlighting, however, that our analyses did find one preventive factor in the PRI for tobacco use – Positive Actions. These Positive Actions include such activities as taking breaks from news and social media, taking care of one’s body, eating healthy and exercising, relaxing, connecting with others, and contacting a health provider. Many of these activities focus on overall health and wellness, and given the decades long educational campaign on the harmfulness of tobacco for the body, may explain why adolescents who would engage in these behaviors may be less likely to use tobacco. Other recent studies, however, have also found decreases in substance use during the pandemic. The prevailing theory as to why substance use may have declined among adolescents during the pandemic are related to reduced access to substances or vaping products, and the decline in social interaction that generally leads to adolescent substance use experimentation [30-32].

Limitations

This secondary analysis has several limitations. First, the data analyzed for this study were collected as supplementary data in an ongoing RCT that was forced to stop recruitment at the onset of the COVID-19 pandemic. Therefore, the research team was limited in the ways they could survey existing participants consistent with the study aims, by the existing sample, and by the existing sampling frame who would be eligible (based on the date of their baseline interview) to complete a 12-month follow-up survey. Second, the parent study RCT was recruiting from two rural FQHCs in Tennessee and New Mexico, so the results of this study may speak more to the experience of rural adolescents and may not be generalizable to suburban or urban adolescents. Third, anxiety and depression measures were not collected at baseline, so it was not possible to detect change from previously reported levels. Finally, our sample was limited to those who were eligible to complete a 12-month survey, who responded to requests to complete the 12-month survey, and those who fully completed the 12-month survey.

Conclusions

The COVID-19 pandemic has profound implications for the development and mental health of adolescents throughout the world, the parameters of which are yet to be fully understood. In the US, the staggering shift in the daily routine of most adolescents

due to pandemic-related lockdowns was a significant life change, and researchers and clinicians do not yet know what the impacts will be on behavioral health in the long-term. Future research is needed to understand which adolescents were impacted and how, and what interventions and services can be offered to this population to minimize negative effects into adulthood.

Funding Source

This paper was supported by funding from the Conrad N. Hilton Foundation (grant number: 16743).

Conflict Disclosure

Authors have no conflicts to report.

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