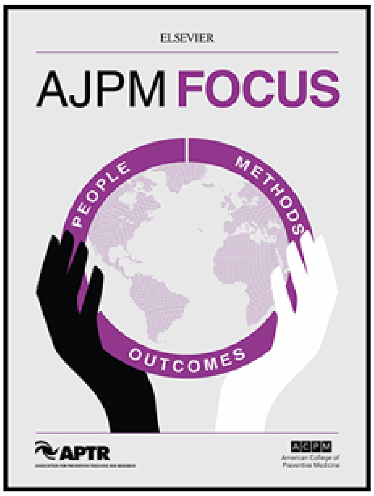
Journal Pre-proof



A Comparison of COVID-19 Outcomes Between Reservation-Area American Indian and U.S. National Students

Randall C. Swaim , Linda R. Stanley , Richard A. Miech , Megan E. Patrick , Meghan A. Crabtree , Mark A. Prince

PII: S2773-0654(22)00044-X
DOI: https://doi.org/10.1016/j.focus.2022.100046
Reference: FOCUS 100046

To appear in: *AJPM Focus*

Received date: 13 July 2022
Revised date: 26 October 2022
Accepted date: 29 October 2022

TITLE PAGE

Title:

A Comparison of COVID-19 Outcomes Between Reservation-Area American Indian and U.S. National Students

Randall C. Swaim[1], Linda R. Stanley[1], Richard A. Miech[2], Megan E. Patrick[2], Meghan A. Crabtree[1], and Mark A. Prince[1]

1. Tri-Ethnic Center for Prevention Research, Department of Psychology, Colorado State University, Fort Collins, CO.

2. Institute for Social Research, University of Michigan, Ann Arbor, MI.

Corresponding Author:

Randall C. Swaim, Ph.D.
332 Behavioral Sciences Building
Department of Psychology
Colorado State University
Fort Collins, CO 80523-1879
Phone: (970) 231-2349
FAX: (970) 491-1032
Email: randall.swaim@colostate.edu

Word Count: 3485
Page Count: 13 (text only)
Tables: 5
Figures 0

Each of the authors reports no conflicts of interest or other financial disclosures.

Randall C. Swaim, Linda R. Stanley, Meghan A. Crabtree, and Mark A. Prince funded by the National Institute on Drug Abuse (R01 DA00371)
Richard A. Miech and Megan E. Patrick were funded by the National Institute on Drug Abuse (R01 DA001411)

The National Institutes of Health and the National Institute on Drug Abuse had no role in the study design, collection, analysis, or interpretation of the data.

Highlights

- This study compared reservation American Indian and national U.S. students on COVID-19 outcomes.

- More American Indian students reported being tested and testing positive than national students.
- More American Indian students reported family/friends testing positive and being hospitalized than national students.
- Changes in substance use since COVID-19 began were variable by group.
- More national students reported increases in negative emotional states than American Indian students.

ABSTRACT

Introduction: This study presents data from two population-based surveys of youth (reservation-area American Indian (AI) adolescents and U.S. adolescents) on self, family, and friend morbidity, and changes in substance use and negative affect during COVID-19.

Material and Methods: Data were obtained in Spring 2021 from surveys of AI students on or near reservations (8th grade, n=398; 10th grade, n=367, 12th grade, n=290) and national students from Monitoring the Future (MTF) (8th grade, n=11,446, 10th grade, n=11,792, 12th grade, n=9,022). Main outcomes were COVID-19 testing, perceived morbidity/mortality, substance-use changes, and emotional changes during COVID-19.

Results: The AI sample had a greater proportion of testing (e.g., AI 8th grade: 58.1% [95% CI; 48.6-68.8]; MTF 8th grade: 43.6% [95% CI; 39.8-47.5]) and friend/family hospitalization (e.g., AI 8th grade: 36.2% [95% CI; 26.2-47.5]; MTF 8th grade: 11.9% [95% CI; 10.6-13.3]). Across grades, greater proportions of the national sample reported increased anxiety, anger, boredom, loneliness, depression, worry, and trouble concentrating, while greater proportions of reservation-area AIs reported decreased anxiety, loneliness, depression.

Conclusions: Findings indicate that reservation-area AI youth experienced unique health consequences one year into the COVID-19 pandemic compared to national students, illustrating the need for AI-specific COVID-19 public health monitoring and response.

Keywords: COVID-19; American Indian; Monitoring the Future; morbidity & mortality; substance use changes; emotional changes.

INTRODUCTION

COVID-19 has led to multiple deaths and disruptions in health, economic security, and well-being worldwide. While youth may be at lower risk,[1] they are not immune from its effects. Even when not infected, youth experience stressors including school disruptions, home confinement, grief, and uncertainty regarding safety and security.[2,3] Youth report worry related to COVID-19[4] depression, and substance use coping, with those reporting depressive symptoms more likely to engage in substance-related coping.[5-8]

Reservation-area American Indian (AI) adolescents are at increased risk for depression, generalized anxiety,[9] substance use,[10] and suicide,[10] with disparities in substance use and psychological outcomes compared to national rates being especially striking. The pandemic introduced new risks for AI populations who experienced higher levels of morbidity and mortality early in the pandemic, especially on reservations.[11-13] In response, tribes took pivotal action,[14] shutting borders and instituting curfews despite institutional, medical, and social barriers.[15]

Though AI populations have suffered significant morbidity and mortality, youth data are sparse.[16] In this study, data from two national studies, one of reservation-area AI youth and one of youth in the contiguous United States, are compared. These studies obtained comparable measures of perceived COVID-19 testing, morbidity and mortality, changes in substance use, and changes in emotional states. Monitoring the Future (MTF) is a nationally representative survey of 8th, 10th and 12th grade students while Our Youth, Our Future (OYOF) annually surveys a nationally representative group of 6-12th grade students living on or near AI reservations. This study assesses both similarities and differences in national and AI student COVID-19 experiences and responses.

MATERIAL & METHODS

The OYOF and MTF studies were approved by the Colorado State University and University of Michigan IRBs respectively. For OYOF, local school board and tribal IRB's were also obtained as required. Both IRBs approved passive consent procedures with parents fully informed of the study and given the opportunity to opt their child out of the study. Assent was obtained from all participating students.

OYOF sample. Study data represent a population-based sample of 20 schools participating during Spring 2021. The OYOF study is described in Swaim and Stanley[17] where the sampling frame, sample and recruitment procedures, and survey procedures are described. Schools were randomly sampled to reflect the AI population from seven culturally distinct U.S. geographic regions as described by Snipp[18].

MTF Sample. Study data represent a population-based sample of 319 schools in the contiguous United States participating in Spring 2021. Johnston et al.[19] describe the sampling frame, sample and recruitment procedures, and survey procedures.

Procedures

OYOF sample. During Spring 2021, schools still implemented modified procedures, operating remotely, in-person, or in hybrid forms.65% of sampled schools were in-person and 35% were hybrid. Due to lack of online access for reservation-area students, no schools operating 100% remotely were surveyed. Prior to administration, parents could opt their child out of the survey (<1% chose this option). Surveys were administered online with Qualtrics software during classroom hours to all eligible 6-12 grade students. Responses were anonymous and students were instructed to skip questions they did not wish to answer. Response rates averaged 60.4% of enrollment.

MTF sample. Schools were recruited regardless of remote status; 26% of students reported remote schooling, 46% in-person schooling, and 28% hybrid schooling. Prior to administration, parents could opt their child out of the survey (<1% chose this option). Surveys were administered online with Illume software. Responses for 8th and 10th grade students were anonymous; 12th grade students provided contact information for follow-up questionnaires. All students were instructed to skip questions they did not wish to answer. Response rates were 82% in 8th grade, 78% in 10th grade, and 69% in 12th grade.

Study Samples

OYOF sample. Data for 8th, 10th, and 12th grade students who self-reported as AI are reported. The sample consisted of the following: grade 8: n=398; grade 10: n=367; grade 12: n=290 (mean age = 15.5, sd = 1.69; male = 46.3%, female = 51.0%, another = 2.7%). The regional distribution was 3.5% Northeast, 39.3% Southwest, 8.1% Northern Plains, 8.9% Upper Great Lakes, 25.1% Southeast, 3.2% Northwest, and 10.8% Southern Great Plains. Observations were weighted to correct for over- or underrepresentation by region, with weights based on the

U.S. 2010 Census reservation and off-reservation trust land state populations. Reservation residence was as follows: on reservation = 44.8%; within 25 miles = 36.6%; greater than 25 miles = 18.7%. Percent of students eligible for free or reduced lunch averaged 64.8% across schools.

MTF sample. The sample consisted of the following: grade 8: n=11,446; grade 10: n=11,792; and grade 12: n=9,022 (mean age = 15.9, sd = .10; male = 47.8%, female = 47.0%, other or prefer not to answer = 5.2%). The racial/ethnicity distribution was white (50.9%), Black or African American (11.4%), Hispanic (16.6%), Asian American (5.1%), American Indian (1.2%), Middle Eastern (0.8%), more than one of these (13.8%). MTF is weighted with the demographic distribution mirroring that of nation. Accordingly, the socioeconomic status of MTF students mirrors that of the nation.

Measures

The following measures were compared: COVID-19 testing and perceived morbidity for self, family, and friends (Table 1); changes in substance use since the pandemic began (Table 2); and changes in emotional states (Table 3). For COVID-19 testing, morbidity, and mortality, measures from CASPE Adolescent Self-Report Survey2 were used. OYOF participants were asked, “Have you had COVID-19?” with four response alternatives (1=No, but I’ve never been tested, 2=No, I tested negative, 3=Yes, but I wasn’t tested for COVID-19, 4=Yes, I tested positive). Responses of 1 or 3 were counted as No for testing and responses of 2 or 4 were counted as Yes. MTF participants were asked, “Have you been tested for COVID-19 at least once?” (1=Yes, 2=No). They were then asked, “Have you ever had a positive test for COVID-19?” (1=Yes, 2=No) with comparisons to OYOF responses reported above as 4=Yes, I tested positive). For family and friend morbidity, OYOF participants were asked, “How many of your family members or close friends have had COVID-19?” (0=0, 1=1, 2=2-3, 3=4-6, 4=more than 6). MTF participants were asked, “Have any of the following people that you know had COVID-19?” (Anyone in your household, some other member of your family, anyone else that you know personally, none of these). Responses of 1 or greater for OYOF and any marked as yes for MTF were compared. OYOF participants were then asked, “How many of your family members or close friends stayed in the hospital because of COVID-19? (0=0, 1=1, 2=2-3, 3=4-6, 4=more than 6). MTF participants were asked, “Were any of the people you knew who had COVID-19 admitted to the hospital because of COVID-19? (1=Yes, 2=No). MTF responses of Yes were compared to OYOF responses of 1 or greater.

Changes in substance use. OYOF students were asked, “After COVID-19 started, how much did your use of (name of substance) change?” MTF students were asked, “How has your use of the following changed since the COVID-19 pandemic started? Both surveys used these response categories (1=decreased a lot, 2=decreased, 3=didn’t change, 4=increased, 5=increased a lot). Responses of 1 or 2 were coded as decreased, and responses of 4 or 5 were coded as increased.

Changes in emotional states. OYOF students were asked, “Compared to before COVID-19, are you . . . (more or less anxious now, etc.) (1=much less, 2=less, 3=about the same, 4=more, 5=much more). MTF students were asked, “How have the following changed for you since the COVID-19 pandemic started?” (feeling anxious, depressed, etc.) (1=decreased a lot, 2=decreased somewhat, 3=didn’t change, 4=increased somewhat, 5=increased a lot). While the wording of responses was slightly different, scaling was comparable. Responses of 1 or 2 from both surveys were coded as “decreased,” and responses of 4 or 5 were coded as “increased.”

Statistical Analysis

Proportions of study variables with 95% logit confidence intervals were calculated using survey commands of Stata® statistical software to account for clustering of students within schools. Only participants who reported use of a substance in the last 12 months were included in calculations for changes in substance use, resulting in substantially lower sample sizes for both samples (see Table 2).

Differences between proportions for the two samples were tested using a z-test for independent proportions. To account for nesting of students within schools, effective sample sizes for each variable within a sample were computed as the actual sample size divided by that variable's design effect.

RESULTS

COVID-19 Testing and Morbidity. Table 1 provides results by grade. For each grade, a significantly higher percentage of AI students reported tests for COVID-19 compared to the MTF sample, with the average difference across grades of 17.1 percentage points. More AI 8th and 10th graders reported testing positive than their MTF counterparts with rates of positivity the same for 12th graders. More AI students reported having family or close friends who contracted COVID-19, but the difference was significant only for 12th graders. Finally, a significantly higher percentage of AI students in each grade reported having family and friends hospitalized, with an average difference across grades of 25.6 percentage points.

Changes in substance use. Table 2 presents results for changes in substance use since the pandemic began for students who had used a substance in the last 12 months. For 8th graders, more AI students reported an increase in getting drunk and smoking marijuana than MTF students. Conversely, more MTF students reported a decrease in getting drunk than AI students. Only one significant difference was found for 10th graders; more MTF students reported a decrease in marijuana smoking than AI students. Finally, for 12th graders, more AI students reported an increase in cigarette smoking than MTF students.

Changes in Emotional States. Table 3 presents findings for changes in emotional states by grade. Significant differences in changes in emotional states were found, and similar patterns were found across grades. MTF students were significantly more likely than AI students to report increases in anxiety, anger, boredom, loneliness, depression, worry, and trouble concentrating at each grade level. For 10th and 12th graders, MTF students were also more likely than AI students to report increases in sadness, while 10th grade MTF students were more likely to report increases in difficulty sleeping.

In contrast, AI students at each grade were significantly more likely than MTF students to report decreases in anxiety, loneliness, and depression. At 8th and 10th grades, AI students were also more likely than MTF students to report decreases in boredom, difficulty sleeping, and difficulty concentrating, while for 10th and 12th graders, AI students were more likely to report decreases in anger and sadness than MTF students.

Tables 4 and 5 present results for changes in emotional state stratified by whether students had family or friends who were hospitalized due to COVID-19. These results show that overall, students who had family or friends hospitalized due to COVID-19 fared more poorly on emotional states in both groups of students compared to students with no family or friends hospitalized. In results not tabled, we computed weighted proportions across grades for each sample for those students who reported having family/friends hospitalized and increases in negative emotional states. Generally, more MTF students reported experiencing increases in emotional distress compared to OYOF students (more anxious: MTF = 59.8%; OYOF = 37.8%; more angry: MTF = 49.9%; OYOF = 36.4%; more bored: MTF = 78.2%; OYOF = 48..0%; more sad: MTF = 63.4%; OYOF = 44.4%; more lonely: MTF = 62.8%; OYOF = 38.3%; more depressed: MTF = 53.4%, OYOF = 37.5%; more worried: MTF = 61.3%; OYOF = 39.2%; more difficulty sleeping: MTF = 49.7%, OYOF =45.2%; more interest in normal activities: MTF = 10.9%; OYOF = 44.3%; more trouble concentrating: MTF = 58.8%, OYOF = 41.4%).

DISCUSSION

The study results illustrate substantial impacts of COVID-19 among the adolescent population one year into the pandemic. Students in both samples saw significant numbers of friends and family hospitalized; many students reported increases in negative emotional states while others reported decreases; and substance use increased for some students and decreased for others.

COVID-19 testing and morbidity. The significantly higher testing among AI students likely reflects actions taken by tribal nations to protect their citizens early in the pandemic. With COVID-19 disproportionately affecting reservations, especially for elders, reservations quickly and proactively developed responses, including curfews, enforcement of stay-at-home orders, and mask mandates. Tribes were among the first to institute widespread testing programs, and they were successful in delivering vaccinations as well.[20] Regarding outcomes of COVID-19 tests, the higher positive tests for AI 8th and 10th graders may reflect higher levels of testing, and may also reflect the disproportionate COVID-19 impact on tribal nations early in the pandemic where AIs were at elevated risk of contracting and dying.[16,21] Finally, AI students were significantly more likely to report knowing someone hospitalized due to COVID-19. Several reasons may account for this difference, including higher underlying comorbidities among the AI population that would lead to more severe disease[21] and greater COVID-19 infection risk in the early days of the pandemic due to factors including more crowded conditions in homes and more work in front-facing occupations.[16]

Changes in substance use. Changes in substance use varied by grade and substance. Overall, there were far more similarities than differences. However, because only students who had used a substance in the last 12 months were included in the calculations for that substance, the AI cell sizes were low, resulting in wide confidence intervals. This may, in part, cause meaningful differences in changes to be nonsignificant.

MTF and AI students at all grade levels were more likely to report decreases, compared to increases, in cigarette smoking, with in-sample differences between increases and decreases especially stark for national rates. The only significant difference between the samples was at grade 12, where a higher percentage of AI students, compared to MTF students, reported increased cigarette smoking. This difference may be due to lower availability and/or increased parental monitoring due to stay-at-home orders. This pattern was not observed for nicotine vaping wherein the percentage of students increasing use was similar to percentages decreasing use, and percentages were similar between samples (with AI 10th graders showing an exception to this pattern). Differences in vaping and cigarette smoking may be due to vaping being easier to hide than cigarette smoking.[5]

No differences were found for changes in alcohol use or intoxication, except for 8th grade where significantly fewer AI students reported a decrease in drunkenness. Within MTF, 10th and 12th graders were more likely to report increased alcohol use than decreased alcohol use. This mirrors an increase in national rates of alcohol use during the first year of COVID-19.[22,23]

Generally, more students reported increased marijuana use than reported decreased use, and, at 8th and 10th grades, AI students were more likely to report increases than MTF students.

Marijuana use among reservation-area AI students is significantly higher than national rates, especially at 8^{th} and 10^{th} grades.[17] Given their higher rates of use, AI students who use may be using more often, possibly to cope with negative emotional states or boredom. Frequent marijuana use among AI adolescents has been linked to use for coping.[24] Finally, no significant differences were found for marijuana edibles, and overall, results suggest that students were as likely to increase use as to decrease use, with about 40%-50% not changing use.

Changes in emotional states. The starkest differences between the samples were for changes in emotional states. For both, a relatively high percentage of students reported increased negative emotional states. However, for nearly all measures at each grade level, the percentage of students reporting an increase was greater for the MTF sample than for the AI reservation-area sample, while percentages of students reporting decreases in negative emotional states were greater for the AI reservation-area sample than for the MTF sample. For example, significantly more MTF students reported increases in anxiety, anger, boredom, loneliness, depression and worry at all grade levels, while significantly more AI students reported decreases in anxiety, loneliness, and depression at all grade levels.

The comparisons between samples on emotional states based on whether they reported having family/friends hospitalized due to COVID-19 were also markedly different. A much higher percentage of MTF students reported an increase in negative emotional states as compared to OYOF students. These results may seem surprising for OYOF youth given comparatively higher levels of morbidity and mortality among members of tribal nations. However, several potential explanations are worth noting. Levels of negative emotional states among reservation-area AI 6^{th}-12^{th} grade students since the start of COVID-19 were relatively high, with substantial numbers of students reporting feeling a negative emotional state often or very often[25]. For example, 47.2% of the AI sample reported feeling sad or lonely often or very often while 69.6% reported feeling bored often or very often. Given that fewer AI students noted an increase in negative affect as compared to MTF rates, it is possible that negative emotional states were higher in reservation-area AI adolescents than nationally prior to the pandemic, a pre-existing ceiling effect. These results are also potentially explained by stress-inoculation in which individuals subjected to high levels of prior stress may not react as strongly to a novel stressor when compared to those with less prior stress[26]. AI youth, historically, are subject to numerous stressors in addition to COVID-19 in the form of intergenerational transmission of historical trauma, systematic cultural genocide, and displacement, the consequences of which continue to this day[27,28]. These findings are similar to findings from a study that found that healthy adolescents reported large increases in anxiety and depression following COVID-19, while adolescents with early life stress reported high but stable levels of anxiety and depression.[2] Although data on psychological states of AI youth are sparse, national and regional data are suggestive of higher negative emotional states pre-pandemic, based on measures of depressed mood and suicide measures.[29-34] Reservation-area students may also be responding more positively to changes in the family environment due to COVID-19 policy stay-at-home orders which were strongly enforced on many reservations.[14] Data supports the latter argument; among AI 6th -12th grade students, a larger percentage reported greater closeness with their families during the pandemic. Research has shown that close-knit families are particularly protective against psychological and behavioral health issues for AI adolescents.[35-37]

Limitations

It is important to note that this study reports on data obtained for only one school year during which COVID-19 was active. As the pandemic continues, new and different findings may emerge. Unlike MTF, the OYOF study did not include schools operating only remotely due to lack of online access for many students. However, dropping remote students from the MTF sample revealed minor differences in the national percentages for all measures except one – the number of family or friends with COVID-19. For all grades, the percentage of family or friends with COVID-19 was approximately ten percentage points higher in the in-school MTF sample than in the full MTF sample. This resulted in one change in significance; the significant difference between the 12th grade MTF and OYOF samples for family/friend with COVID-19 became nonsignificant, consistent with the original findings for 8th and 10th graders.

Neither sample contains adolescents who dropped out of school. The results, therefore, generalize to adolescents who attend school, the vast majority of school-age adolescents.[38] In addition, the study relies on self-reported responses, which may be subject to social desirability bias. The anonymity (OYOF and 8th and 10th grade MTF) and confidentiality (12th grade MTF) of these studies work to diminish this potential bias. Respondents who do not provide personally identifying information on the questionnaires have little motivation to distort their reports in socially desirable directions. Finally, numbers of AI students used in calculations of changes in substance use and emotional outcomes were small, causing potentially meaningful differences in changes in these variables across samples to be nonsignificant. Such small sample sizes may also bias the estimates. Although AI sample sizes for each grade were substantially less than national sample sizes, this AI sample is the only representative sample of reservation-area AI adolescents, and each sample was selected to represent each population.

CONCLUSIONS

Compared to national adolescents in general, reservation-area AI adolescents show unique health COVID-19 consequences one year into the pandemic. In particular, AI students had more COVID-19 testing and positive test results than MTF students. Differences in substance use were inconsistent across grades. However, AI student were also buffered from some of the negative impacts of COVID. In fact, MTF students reported greater increases in anxiety, depression, and other indicators of mental health difficulties. These results document the need for careful tracking of mental health and substance use as potential COVID-19 youth outcomes. In addition, they highlight that AI youth have been protected from some negative mental health impacts, perhaps due to having lived with the inoculating effects of other stressors prior to COVID-19. Future research is needed for Indigenous youth and AI-specific populations to assess the full extent of these consequences and to inform efforts aimed at addressing them through public health dissemination and treatment.

ACKNOWLEDGEMENTS

The research presented in this paper is that of the authors and does not reflect the official policy of the NIH.

Randall C. Swaim, Linda R. Stanley, Meghan A. Crabtree, and Mark A. Prince were funded by the National Institute on Drug Abuse (R01 DA00371). Richard A. Miech and Megan E. Patrick were funded by the National Institute on Drug Abuse (R01 DA001411).

All authors contributed substantially to the completion of this manuscript. Drs. Swaim, Stanley, Prince, Miech, and Patrick obtained funding for the study. Drs. Swaim, Stanley, and Miech conceptualized the design of the study, completed statistical analyses, and wrote the initial drafts. Drs. Patrick, Crabtree, and Prince edited the initial manuscript and all authors reviewed and accepted its final version.

CRediT Author Statement

Randall C. Swaim: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Project administration; Writing – Original draft, Review and editing; Linda R. Stanley: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Project administration; Writing – Original draft, Review and editing; Richard A. Miech: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Project administration; Writing – Original draft, Review and editing; Megan E. Patrick: Funding acquisition, Project administration; Writing – Review and editing; Meghan A. Crabtree: Writing – Review and editing; Mark A. Prince: Funding acquisition, Writing – Review and editing.

Declaration of interests

☐The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☒The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Randall C. Swaim reports financial support was provided by National Institute on Drug Abuse.

REFERENCES

1. Mantovani A, Rinaldi E, Zusi C, Beatrice G, Saccomani MD, Dalbeni A. Coronavirus disease 201(COVID-19) in children and/or adolescents: a meta-analysis. *Pediatr Res.* 2021;89(4):733-737. doi: 10.1038/s41390-020-1015-2.

2. Cohen ZP, Cosgrove KT, DeVille DC, et al. The impact of COVID-19 on adolescent mental health:preliminary findings from a longitudinal sample of healthy and at-risk adolescents. *Front Pediatr.* 2021;9. doi: 10.3389/fped.2021.622608.

3. Guessoum SB, Lachal J, Radjack R, et al. Adolescent psychiatric disorders during the COVID-19 pandemic and lockdown. *Psychiatry Res.* 2020;291:113264-113264. doi: 10.1016/j.psychres.2020.113264.

4. Waselewski E, Waselewski M, Harper C, Dickey S, Bell SA, Chang T. Perspectives of U.S. youth during initial month of the COVID-19 pandemic. *Ann Fam Med.* 2021;19(2):141-147. doi.org/10.1370/afm.2642

5. Pelham WE, Tapert SF, Gonzalez MR, et al. Early adolescent substance use before and during the COVID-19 pandemic: A longitunidal survey in the ABCD study cohort. *J Adolesc Health.* 2021;69:390-397. doi.org/10.1016/j.jadohealth.2021.06.015

6. Romano I, Patte KA, de Groh M, et al. Substance-related coping behaviours among youth during the early months of the COVID-19 pandemic. *Addict Behav Rep.* 2021;14. doi: 10.1016/j.abrep.2021.100392.

7. Patrick ME, Parks MJ, Fairlie AM, Kreski NT, Keyes KM, Miech R. Using substances to cope with the COVID-19 pandemic: U.S. national data at age 19 years. *J Adolesc Health.* 2022;70(2):340-344. doi.org/10.1016/j.jadohealth.2021.11.006

8. Miech R, Patrick ME, Keyes K, O'Malley PM, Johnston L. Adolescent drug use before and during U.S. national COVID-19 social distancing policies. *Drug Alcohol Depend.* 2021;226. doi: 10.1016/j.drugalcdep.2021.108822

9. Serafini K, Donovan DM, Wendt DC, Matsumiya B, McCarty CA. A comparison of early adolescent behavioral health risks among urban American Indians/Alaska Natives and their peers. *Am Indian Alsk Native Ment Health Res.* 2017;24(2):1-17. doi:10.5820/aian.2402.2017.1

10. Heron M. Deaths: leading causes for 2013. *Natl Vital Stat Rep.* 2016;65(2)1-95.

11. Burki T. COVID-19 among American Indians and Alaska Natives. *Lancet Infect Dis.* 2021;21(3):325-326. doi.org/10.1016/S1473-3099(21)00083-9

12. Hatcher SM, Agnew-Brune C, Anderson M, et al. COVID-19 among American Indian and Alaska Native persons - 23 states, January 31-July 3, 2020. *MMWR. Morb Mortal Wkly Rep.* 2020;69(34):1166-1169. doi:10.15585/mmwr.mm6934e1

13. Kakol M, Upson D, Sood A. Susceptibility of southwestern American Indian tribes to Coronavirus disease 2019 (COVID-19). *J Rural Health.* 2021;37(1):197-199. doi:10.1111/jrh.12451

14. Sorelle R. Decisive action by Navajo Nation curbs COVID-19. *Emerg Med News.* 2020;42(11): 33-34. doi: 10.1097/01.EEM.0000722392.86269.a3

15. Wang H. Why the Navajo Nation was hit so hard by coronavirus: Understanding the disproportionate impact of the COVID-19 pandemic. *Appl Geogr.* 2021;134. doi.org/10.1016/j.apgeog.2021.102526

16. Hooper MW, Nápoles AM, Pérez-Stable EJ. COVID-19 and racial/ethnic disparities. *JAMA.* 2020;323(24):2466-2467. doi:10.1001/jama.2020.8598

17. Swaim RC, Stanley LR. Substance use among American Indian youths on reservations compared with a national sample of US adolescents. *JAMA Netw Open*. 2018; May 31. doi:10.1001/jamanetworkopen.2018.0382

18. Snipp CM. American Indian and Alaska Native children: Results from the 2000 Census Population Reference Bureau. Washington, DC: *Population Reference Bureau*; 2005.

19. Johnston LD., Miech RA, O'Malley PM, Bachman JG, Schulenberg, JE, Patrick ME. Monitoring the Future national survey results on drug use, 1975-2021: Overview, key findings

on adolescent drug use, 2022. Ann Arbor: Institute for Social Research, The University of Michigan. http://monitoringthefuture.org/pubs/monographs/mtf-overview2021.pdf

20. Florey K. The tribal COVID-19 response. *Regul Rev*. March 17, 2021. Retrieved from https://www.theregreview.org/2021/03/17/florey-tribal-covid-19-response/. Accessed January 22, 2022.

21. Akee R, Reber S. *American Indians and Alaska Natives are dying of COVID-19 at shocking rates.* Washington, D.C.: Brookings Insitution; 2021. https://www.brookings.edu/research/american-indians-and-alaska-natives-are-dying-of-covid-19-at-shocking-rates/

22. Barbosa C, Cowell AJ, Dowd WN. Alcohol consumption in response to the COVID-19 pandemic in the United States. *J Addict Med*. 2021;15(4):341-344. doi:10.1097/ADM.0000000000000767

23. Pollard MS, Tucker JS, Green HD. Changes in adult acohol use and consequences during the COVID-19 pandemic in the US. *JAMA Netw Open.* 2020;3(9):e2022942. doi:10.1001/jamanetworkopen.2020.22942

24. Swaim RC, Stanley LR. Latent class analysis and predictors of marijuana use among reservation-based American Indian high school students. *J Psychoactive Drugs.* 2021:1-11. doi.org/10.1080/02791072.2021.1918806

25. Stanley LR, Crabtree MA, Swaim, RC, Prince, MA. Self-reported illness experiences and psychosocial outcomes for reservation-area American Indian youth during COVID-19. *JAMA Netw Open*. 2022; September 14. doi:10.1001/jamanetworkopen.2022.31764

26. Fergus S, Zimmerman, MA. Adolescent resilience: A framework for understanding healthy development in the face of risk. *Annu Rev Public Health*. 2005;26:399-419. doi: 10.1146/annurev.publhealth.26.021304.144357

27. Hartmann WE, Wendt DC, Burrage RL, Pomerville A, Gone JP. American Indian historical trauma: Anticolonial prescriptions for healing, resilience, and survivance. *Amer Psychol*. 2019;74:6-19. doi.org/10.1037/amp000032

28. Stanley LR, Swaim RC, Kaholokula JK, Kelly KJ, Belcourt A, Allen J. The imperative for research to promote health equity in Indigenous communities. *Prev Sci*. 2017; 21(Suppl 1):S13-S21. doi.org/10.1007/s11121-017-0850-9

29. Brockie TN, Heinzelmann M, Gill J. A framework to examine the role of epigenetics in health disparities among Native Americans. *Nurs Res Pract.* 2013;2013:410395. doi: 10.1155/2013/410395

30. Sarche M, Spicer P. Poverty and health disparities for American Indian and Alaska Native children: current knowledge and future prospects. *Ann NY Acad Sci.* 2008;1136:126-136. doi.org/10.1196/annals.1425.017

31. Brockie TN, Dana-Sacco G, Wallen GR, Wilcox HC, Campbell JC. The relationship of adverse childhood experiences to PTSD, depression, poly-drug use and suicide attempt in reservation-based Native American adolescents and young adults. *Am J Community Psychol.* 2015;55(3-4):411-421. doi:10.1007/s10464-015-9721-3

32. Subica AM, Wu LT. Substance use and suicide in Pacific Islander, American Indian, and Multiracial youth. *Am J Prev Med.* 2018;54(6):795-805. Retrieved from https://www.cdc.gov/nchs/data/hestat/suicide/rates_1999_2017.htm. Accessed January 12, 2022.

33. Curtin SC, Hedegaard H. Suicide rates for females and males by race and ethnicity: United States, 1999 and 2017. NCHS Health E-Stat. 2019.35.

34. Doshi S, Allison J, Kelly K, Solomon D. *The COVID-19 Response in Indian Country.* June 18, 2020. Retrieved from: https://www.americanprogress.org/article/covid-19-response-indian-country/. Accessed January 10, 2022.

35. Cwik MF, Rosenstock S, Tingey L, Redmond C, Goklish N,Larzelere-Hinton, F, Barlow A. Exploration of pathways to binge drinking among American Indian adolescents. *Prev Sci.* 2017;18(5):545-554. doi:10.1007/s11121-017-0752-x

36. Martin D, Yurkovich E. "Close-knit" defines a healthy Native American Indian family. *J Fam Nurs*. 2014;20(1):51-72. doi.org/10.1177/1074840713508604

37. Moon SS, Blakey JM, Boyas J, Horton K, Kim YJ. The influence of parental, peer, and school factors on marijuana use among Native American adolescents. *J Soc Serv Res.* 2014;40(2):147-159. doi.org/10.1080/01488376.2013.865578

38. Child Trends Databank. *High School Dropout Rates.* 2018.

Table 1. Percentage of AIS and NS students tested for COVID-19 and morbidity for self and others

	8th grade		10th grade		12th grade	
	AIS (%) (95% CI)[c]	NS (%) (95% CI)	AIS (%) (95% CI)	NS (%) (95% CI)	AIS (%) (95% CI)	NS (%) (95% CI)
Tested	N=391 (59.1) (48.6, 68.8)**	N=10,333 (43.6) (39.8, 47.5)	N=357 (63.8) (53.5, 73..40)**	N=10,590 (45.2) (42.0, 48.5)	N=278 (69.1) (57.5, 78.7)*	N=8,025 (52.7) (48.5, 57.0)
Tested positive[a]	N=391 (13.1) (8.7, 19.3)*	N=10,315 (8.7) (7.9, 9.6)	N=357 (17.3) (13.3, 22.1)**	N=10,577 (11.0) (9.7, 12.4)	N=278 (12.5) (10.1, 15.5)	N=8,013 (12.5) (11.3, 13.9)
Family or friends had COVID	N=384 (71.9) (61.9, 80.2)	N=11,446 (66.0) (62.6, 69.3)	N=355 (76.4) (63.8, 85.6)	N=11,792 (69.3) (66.7, 71.8)	N=279 (86.0) (78.1, 91.3)**	N=9,022 (67.6) (64.2, 70.8)
Family or friends hospitalized due to COVID[b]	N=387 (36.2) (26.2, 47.5)**	N=11,445 (11.9) (10.6, 13.3)	N=352 (36.8) (25.5, 49.9)**	N=11,788 (13.8) (12.7, 15.0)	N=279 (42.3) (34.8, 50.1)**	N=9,020 (12.70) (11.3,14.3)

AIS=Reservation-area American Indian sample from Our Youth, Our Future study; NS=National sample from Monitoring the Future study.
*Significant difference in prevalence for AIS and NS at p<.05.
** Significant difference in prevalence for AIS and NS at p<.01.
[a] Students who had not been tested for COVID-19 were coded to 0.
[b]Students who reported they did not have any family or friends with COVID-19 are coded to 0.

Table 2. Percentage of AIS and NS students reporting substance use changes since COVID-19 began with sample sizes for each substance[a]

	8th grade		*10th grade*		*12th grade*	
	AIS (%) (95% CI)	*NS (%) (95% CI)*	*AIS (%) (95% CI)*	*NS (%) (95% CI)*	*AIS (%) (95% CI)*	*NS (%) (95% CI)*
Cigarette smoking	n=22	n=727	n=35	n=989	n=32	n=1281
Decreased	44.7 (20.6, 71.6)	52.0 (47.6, 56.3)	38.3 (14.1, 70.1)	45.6 (41.6, 49.7)	39.4 (22.7, 59.0)	43.5 (39.5, 47.6)
Increased	23.2 (3.7, 70.4)	11.6 (9.0, 14.7)	20.7 (8.9, 41.1)	12.6 (9.9, 15.7)	30.1 (13.7, 53.7)*	13.8 (9.3, 19.9)
Nicotine vaping	n=70	n=1272	n=116	n=2123	n=73	n=2111
Decreased	39.3 (27.7, 52.4)	34.4 (31.8, 37.0)	23.3 (15.6, 33.3)	31.2 (28.2, 34.3)	33.5 (14.8, 59.3)	34.8 (31.0, 38.8)
Increased	37.5 (17.9, 62.2)	37.0 (34.0, 40.1)	35.8 (26.0, 46.9)	39.0 (35.8, 42.3)	32.3 (21.1, 46.0)	34.2 (30.9, 37.6)
Alcohol use	n=62	n=1702	n=105	n=3071	n=102	n=3910
Decreased	24.5 (15.8, 36.2)	31.2 (28.2, 34.3)	20.1 (9.9, 36.6)	22.9 (20.3, 25.8)	33.3 (13.2, 62.0)	27.0 (24.6, 29.7)
Increased	25.2 (9.4, 52.1)	27.3 (24.1, 30.7)	29.2 (18.4, 43.0)	35.8 (33.1, 38.7)	29.1 (13.0, 52.9)	33.3 (30.6, 36.1)
Getting drunk	n=42	n=1691	n=76	n=3058	n=75	n=3901
Decreased	15.0 (2.8, 52.2)**	35.2 (32.1, 38.4)	28.9 (13.4, 51.7)	25.0 (22.1, 28.0)	34.5 (16.4, 58.5)	29.3 (27.0, 31.6)
Increased	30.7 (15.3, 52.0)*	17.6 (14.8, 20.9)	31.8 (21.2, 44.7)	28.2 (25.9, 30.6)	29.5 (19.6, 41.8)	27.1 (24.6, 29.7)
Marijuana smoking	n=67	n=869	n=100	n=2020	n=75	n=2467
Decreased	32.7 (21.7, 46.1)	30.9 (27.1, 35)	17.9 (12.3, 25.5)*	25.9 (23.4, 28.6)	27.3 (15.0, 44.4)	25.2 (22.5, 28.2)
Increased	48.5 (42.4, 54.6)*	35.0 (30.7, 39.5)	44.6 (31.2, 58.8)	42.0 (38.6, 45.6)	35.7 (22.8, 51.0)	39.5 (35.6, 43.5)
Marijuana edibles	n=43	n=862	n=64	n=1996	n= 43	n=2446
Decreased	27.4 (17.5, 40.3)	34.6 (30.1, 39.4)	19.2 (4.5, 54.5)	30.6 (27.5, 33.8)	21.4 (12.0, 35.3)	30.9 (27.5, 34.6)
Increased	35.1 (21.4, 51.8)	27.5 (23.2, 32.2)	30.7 (12.1, 58.7)	27.0 (23.2, 31.1)	22.6 (5.6, 58.7)	26.2 (22.9, 29.7)

AIS=Reservation-area American Indian sample from Our Youth, Our Future study; NS=National sample from Monitoring the Future study.
*Significant difference in prevalence for AIS and NS at p<.05.

** Significant difference in prevalence for AIS and NS at p<.01.
[a]Only students who had used a substance in the last 12 months were included in the calculations for that substance.

Table 3. Percentage of AIS and NS students reporting changes in emotional states since COVID-19 began

	8th grade	*10th grade*	*12th grade*			
	AIS (%) (95% CI)	*NS (%) (95% CI)*	*AIS (%) (95% CI)*	*NS (%) (95% CI)*	*AIS (%) (95% CI)*	*NS (%) (95% CI)*
Feeling Anxious	n=227	n=10021	n=204	n=10370	n=165	n=7827
Decreased	34.0 (26.2, 42.7)**	19.5 (17.8, 21.3)	28.1 (23.8, 32.9)**	16.2 (14.9, 17.6)	28.6 (19.4, 40.1)**	15.8 (14.2, 17.6)
Increased	31.8 (25.2, 39.1)**	45.6 (43.8, 47.4)	34.6 (24.2, 46.6)**	51.8 (49.8, 53.8)	34.2 (27.5, 41.6)**	51.5 (48.1, 54.9)
Feeling angry	n=225	n=10019	n=204	n=10364	n=158	n=7812
Decreased	24.4 (15.9, 35.6)	18.4 (16.9, 20.0)	31.7 (17.7, 50.0)**	16.0 (14.7, 17.4)	32.7 (19.4, 49.5)**	15.5 (13.9, 17.2)
Increased	33.6 (29.2, 38.3)**	40.6 (39.3, 42.0)	28.8 (17.6, 43.2)**	43.2 (41.7, 44.6)	25.6 (19.1, 33.4)**	42.2 (40.0, 44.5)
Feeling bored	n=223	n=10024	n=210	n=10365	n=156	n=7813
Decreased	19.0 (13.2, 26.5)**	10.9 (9.9, 12.0)	20.1 (11.9, 31.9)**	8.9 (8.0, 10.0)	16.0 (6.8, 33.1)	10.5 (9.3, 11.9)
Increased	50.2 (41.1, 59.3)**	71.4 (69.8, 73.0)	46.9 (27.4, 67.4)**	73.2 (71.2, 75.0)	37.6 (28.3, 47.8)**	67.4 (64.6, 70.1)
Feeling sad	n=224	n=10002	n=204	n=10343	n=157	n=7801
Decreased	25.4 (15.5, 38.7)	17.7 (16.0, 19.6)	31.4 (20.1, 45.4)**	13.4 (12.2, 14.7)	36.1 (29.4, 43.4)**	13.3 (11.8, 15.0)
Increased	44.7 (38.1, 51.6)	47.6 (45.8, 49.3)	37.2 (31.7, 43.2)**	55.8 (53.4, 58.2)	31.5 (25.7, 38.0)**	54.2 (50.8, 57.4)
Feeling Lonely	n=224	n=9996	n=204	n=10329	n=158	n=7790
Decreased	29.5 (18.8, 43.2)**	17.7 (16.2, 19.4)	35.9 (26.8, 46.2)**	14.3 (13.2, 15.5)	35.3 (27.5, 44.1)**	14.4 (12.8, 16.2)
Increased	37.3 (27.1, 48.7)*	48.2 (46.5, 50.0)	32.7 (27.0, 39.1)**	55.6 (53.5, 57.6)	29.6 (21.2, 39.6)**	53.5 (50.1, 56.8)
Feeling depressed	n=226	n=9978	n=205	n=10335	n=165	n=7794
Decreased	33.9 (27.4, 41.1)**	20.9 (19.0, 22.9)	32.2 (22.5, 43.8)**	15.8 (14.6, 17.2)	31.8 (21.3, 44.6)**	15.0 (13.5, 16.7)
Increased	31.8 (25.7, 38.7)**	39.3 (37.8, 40.9)	36.2 (28.9, 44.3)**	47.8 (46, 49.7)	36.9 (28.0, 46.8)*	47.1 (43.4, 50.8)
Feeling worried	n=220	n=9958	n=210	n=10336	n=155	n=7791
Decreased	27.3 (14.5, 45.3)	17.5 (15.8, 19.4)	24.0 (16.8, 33.1)**	14.5 (13.3, 15.9)	21.0 (16.8, 25.8)*	14.0 (12.5, 15.8)
Increased	31.5 (25.4, 38.4)**	45.7 (43.9, 47.5)	36.4 (27.8, 45.9)**	50.9 (48.8, 53)	32.2 (25.4, 39.8)**	51.8 (48.3, 55.3)
Difficulty with sleeping	n=226	n=9976	n=205	n=10350	N=165	n=7797
Decreased	30.0 (19.9,	18.8 (17.4,	25.4 (19.1,	15.7 (14.5,	24.9 (11.8,	16.2 (14.9,

	42.5)**	20.2)	33.0)**	17.0)	45.0)	17.7)
Increased	40.1 (34.3, 46.1)	40.3 (38.8, 41.8)	33.4 (25.2, 42.7)**	43.7 (42.2, 45.1)	39.5 (30.7, 49.2)	41.7 (39.6, 43.8)
Interest in normal activities	n=224	n=9982	n=204	n=10345	n=158	n=7792
Decreased	29.3 (23.3, 36.2)*	37.1 (35.6, 38.7)	26.8 (19.6, 35.5)**	43.9 (42.2, 45.7)	24.8 (12.2, 44.0)*	42.8 (40.5, 45.1)
Increased	32.9 (24.5, 42.5)	18.9 (17.5, 20.4)	37.8 (34.1, 41.8)	15.1 (14.0, 16.2)	35.9 (28.7, 43.8)	15.1 (13.7, 16.7)
Trouble concentrating	n=221	n=9990	n=210	n=10351	n=155	n=7803
Decreased	25.2 (17.7, 34.4)**	15.9 (14.3, 17.7)	18.0 (15.0, 21.4)**	12.0 (10.9, 13.3)	11.8 (6.4, 20.7)	12.7 (11.3, 14.3)
Increased	31.6 (22.2, 42.9)**	44.6 (42.8, 46.4)	43.5 (31.3, 56.5)**	54.3 (51.4, 57.1)	39.3 (29.1, 50.4)**	51.3 (48.1, 54.5)

AIS=Reservation-area American Indian sample from Our Youth, Our Future study; NS=National sample from Monitoring the Future study.

*Significant difference in prevalence for AIS and NS at p<.05.

** Significant difference in prevalence for AIS and NS at p<.01.

Table 4. Percentage of OYOF students reporting changes in emotional states since COVID-19 began, by respondent report if a family member/friend had been hospitalized by COVID.

	8th grade		*10th grade*		*12th grade*	
	F/f hospitalized (95% CI)	*None hospitalized (95% CI)*	*F/f hospitalized (95% CI)*	*None hospitalized (95% CI)*	*F/f hospitalized (95% CI)*	*None hospitalized (95% CI)*
Feeling Anxious	n=71	n=153	n=64	n=137	n=65	n=99
Decreased	31.7 (18.6, 48.4)	35.3 (22.8, 50.2)	26.0 (20.6, 32.3)	30.3 (24.8, 36.5)	25.4 (12.9, 44.0)	32.3 (18.1, 50.9)
Increased	37.9 (22.7, 56.0)	28.2 (21.6, 35.9)	35.4 (15.5, 62.1)	35.3 (25.6, 46.4)	40.1 (29.4, 51.7)	30.5 (15.8, 50.5)
Feeling angry	n=69	n=153	n=60	n=141	n=61	n=96
Decreased	22.9 (14.9, 33.5)	25.7 (15.4, 39.7)	30.2 (17.5, 47.0)	33.0 (18.4, 51.9)	15.0* (9.0, 23.9)	43.5 (23.7, 65.6)
Increased	31.7 (19.2, 47.6)	33.9 (26.2, 42.6)	41.1** (24.5, 60.1)	23.4 (15.8, 33.4)	37.2 (22.8, 54.4)	17.8 (8.2, 34.4)
Feeling bored	n=67	n=154	n=70	n=138	n=53	n=103
Decreased	24.7 (18.9, 31.5)	16.2 (8.3, 29.1)	14.1 (4.8, 34.9)	24.1 (10.4, 46.6)	14.8 (4.4, 39.9)	16.8 (8.0, 31.9)
Increased	48.9 (37.1, 60.7)	50.2 (42.3, 58.1)	50.9 (28.6, 72.9)	45.0 (27.7, 63.7)	42.8 (23.1, 65.1)	34.0 (22.2, 48.2)
Feeling sad	n=68	n=153	n=60	n=141	n=61	n=95
Decreased	20.9 (8.9, 41.8)	27.6 (16.0, 43.2)	21.3 (12.3, 34.5)	36.9 (20.7, 56.6)	25.6 (13.7, 42.6)	41.7 (30.9, 53.4)
Increased	51.2 (42.1, 60.4)	40.8 (30.3, 52.2)	44.8 (29.5, 61.1)	34.1 (30.2, 38.2)	37.4 (24.7, 52.1)	28.2 (19.4, 39.0)
Feeling Lonely	n=68	n=153	n=60	n=141	n=61	n=96
Decreased	27.0 (16.7, 40.5)	31.5 (18.0, 49.0)	25.8 (7.0, 61.5)	41.5 (24.1, 61.2)	26.7 (9.3, 56.5)	39.6 (29.4, 50.7)
Increased	37.0 (23.1, 53.4)	37.5 (26.0, 50.7)	40.5 (27.4, 55.0)	29.4 (21.3, 38.9)	38.0* (24.9, 53.2)	24.3 (13.8, 39.2)
Feeling depressed	n=71	n=152	n=64	n=138	n=65	n=99
Decreased	31.3 (21.6, 42.9)	34.7 (23.7, 47.7)	30.6 (19.8, 44.0)	34.3 (20.8, 51.0)	29.1 (10.8, 58.2)	35.2 (22.7, 50.2)
Increased	31.9 (25.8, 38.9)	32.0 (25.8, 38.9)	37.5 (18.0, 62.1)	36.8 (22.9, 53.3)	43.8 (33.8, 54.4)	32.6 (17.2, 52.9)
Feeling worried	n=65	n=153	n=70	n=138	n=53	n=102
Decreased	29.7 (19.8, 42.0)	25.7 (10.8, 49.7)	18.7 (12.9, 26.2)	27.7 (18.2, 39.8)	26.0 (15.6, 39.9)	17.6 (11.3, 26.2)
Increased	32.1 (18.4, 49.7)	31.0 (22.1, 41.6)	43.3 (27.8, 60.2)	32.9 (25.7, 40.9)	42.6 (27.2, 59.5)	25.1 (14.6, 39.6)

Difficulty with sleeping	n=71	n=152	n=64	n=138	n=65	n=99
Decreased	28.0 (17.7, 41.4)	31.1 (19.7, 45.3)	24.9 (10.9, 47.3)	26.6 (19.1, 35.8)	22.6 (9.9, 43.8)	27.7 (9.1, 59.4)
Increased	49.6 (37.4, 61.7)	34.8 (28.1, 42.1)	39.4 (13.2, 73.5)	31.0 (22.5, 41.2)	46.1 (31.4, 61.4)	31.9 (12.0, 61.9)
Interest in normal activities	n=68	n=153	n=60	n=141	n=61	n=96
Decreased	29.0 (20.5, 39.3)	30.0 (22.6, 38.7)	16.4 (7.4, 32.3)	32.0 (22.4, 43.4)	12.8 (2.2, 48.8)	31.1 (15.6, 52.4)
Increased	37.0 (24.1, 52.1)	30.7 (22.1, 40.8)	44.9 (30.0, 60.7)	35.3 (27.8, 43.6)	52.0** (41.7, 62.1)	25.1 (14.7, 39.6)
Trouble concentrating	n=66	n=153	n=70	n=138	n=53	n=102
Decreased	36.8* (21.5, 55.3)	18.8 (12.3, 27.7)	15.5 (9.9, 23.4)	19.8 (13.9, 27.5)	6.9* (2.8, 15.8)	15.1 (8.8, 24.6)
Increased	28.5 (17.7, 42.6)	32.9 (22.4, 45.7)	48.6 (25.6, 72.3)	40.8 (33.2, 48.9	48.2 (30.2, 66.9)	33.1 (22.8, 45.4)

* P<.05, **P<.01.

Table 5. Percentage of MTF students reporting changes in emotional states since COVID-19 began, by respondent report if a family member/friend had been hospitalized by COVID.*

	MTF 8th grade		*10th grade*		*12th grade*	
	F/f hospitalized (95% CI)	*None hospitalized (95% CI)*	*F/f hospitalized (95% CI)*	*None hospitalized (95% CI)*	*F/f hospitalized (95% CI)*	*None hospitalized (95% CI)*
Feeling Anxious	n=1257	n=8764	n=1619	n=8753	n=1249	n=6579
Decreased	12.3	20.6	12.2	17	8.2	17.1
	(10.4, 14.5)	(18.8, 22.5)	(10, 14.7)	(15.5, 18.6)	(6.3, 10.5)	(15.4, 19.1)
Increased	55.8	44	60.5	50.2	63.6	49.4
	(52.6, 59)	(42.1, 46)	(56.6, 64.3)	(48, 52.4)	(57.5, 69.3)	(46, 52.8)
Feeling angry	n=1259	n=8760	n=1619	n=8747	n=1248	n=6565
Decreased	12.3	19.3	10.7	16.9	8.7	16.7
	(10.1, 14.9)	(17.7, 21.1)	(8.9, 12.7)	(15.5, 18.5)	(6.8, 11)	(15, 18.5)
Increased	48.3	39.5	50.3	41.9	51.3	40.7
	(45.2, 51.4)	(37.9, 41)	(47.5, 53)	(40.4, 43.4)	(45, 57.6)	(38.7, 42.7)
Feeling bored	n=1261	n=8764	n=1616	n=8751	n=1251	n=6563
Decreased	8	11.4	4.5	9.7	4.7	11.5
	(6.4, 9.9)	(10.3, 12.6)	(3.3, 6)	(8.6, 10.9)	(3.4, 6.5)	(10.1, 13.1)
Increased	77	70.6	80.8	71.8	74.0	66.3
	(73.7, 79.9)	(68.8, 72.3)	(78, 83.3)	(69.8, 73.7)	(67.8, 79.4)	(63.6, 68.9)
Feeling sad	n=1256	n=8746	n=1617	n=8728	n=1248	n=6554
Decreased	11.8	18.6	7.8	14.4	6.1	14.5
	(9.7, 14.3)	(16.7, 20.7)	(6.2, 9.8)	(13, 15.8)	(4.6, 8.2)	(12.8, 16.3)
Increased	59.7	45.7	64.6	54.2	67.2	51.9
	(56, 63.4)	(43.9, 47.4)	(60.5, 68.5)	(51.9, 56.5)	(61.7, 72.3)	(48.6, 55.3)
Feeling Lonely	n=1257	n=8739	n=1617	n=8714	n=1247	n=6544
Decreased	12.8	18.5	8.3	15.4	8.3	15.5
	(10.5, 15.5)	(16.8, 20.3)	(6.7, 10.3)	(14.1, 16.7)	(6.3, 10.8)	(13.7, 17.4)
Increased	59.8	46.4	65.3	53.8	62.7	51.9
	(56.3, 63.3)	(44.6, 48.2)	(61.5, 68.8)	(51.8, 55.8)	(57.2, 68)	(48.5, 55.3)
Feeling depressed	n=1252	n=8726	n=1617	n=8720	n=1247	n=6548
Decreased	14.2	21.9	11.7	16.6	8.6	16.1
	(11.7, 17.1)	(19.9, 24.1)	(9.8, 13.9)	(15.3, 18)	(6.7, 10.9)	(14.5, 17.9)
Increased	48.2	38	54.2	46.7	57.7	45.3
	(44.5, 52)	(36.4, 39.5)	(51.6, 56.7)	(44.6, 48.8)	(53, 62.4)	(41.4, 49.2)
Feeling worried	n=1250	n=8708	n=1614	n=8724	n=1246	n=6546
Decreased	11.5	18.5	7.9	15.7	7.1	15.2
	(9.3, 14)	(16.6, 20.5)	(6.4, 9.6)	(14.3, 17.2)	(5.4, 9.3)	(13.5, 17.1)
Increased	58.1	43.8	60.4	49.2	65.7	49.4
	(54.7, 61.4)	(42, 45.6)	(57.4, 63.4)	(46.9, 51.4)	(60.1, 70.9)	(46, 52.9)
Difficulty with sleeping	n=1251	n=8725	n=1616	n=8736	n=1244	n=6554

Decreased	15.5 (13, 18.4)	19.3 (17.8, 20.8)	9.6 (7.7, 11.9)	16.8 (15.5, 18.2)	10.3 (8, 13.3)	17.3 (15.7, 18.9)
Increased	46.1 (42.6, 49.5)	39.4 (37.9, 40.9)	52.2 (49.6, 54.9)	42.1 (40.6, 43.6)	50 (44.8, 55.2)	40.3 (38.1, 42.5)
Interest in normal activities	n=1256	n=8726	n=1617	n=8730	n=1245	n=6548
Decreased	43.9 (40.4, 47.4)	36.1 (34.6, 37.7)	50.5 (47.1, 54)	42.7 (40.7, 44.8)	53.0 (48.2, 57.7)	41.0 (38.9, 43.2)
Increased	14.3 (11.9, 17)	19.6 (18.1, 21.3)	10.3 (8.1, 13)	15.9 (14.7, 17.3)	8.5 (6.6, 11)	16.3 (14.7, 17.9)
Trouble concentrating	n=1257	n=8733	n=1616	n=8737	n=1250	n=6554
Decreased	11.9 (9.7, 14.4)	16.6 (14.8, 18.5)	6.6 (5, 8.5)	13 (11.8, 14.4)	5.5 (4.1, 7.4)	14.0 (12.5, 15.7)
Increased	53.6 (50.1, 57.2)	43.2 (41.3, 45)	60.2 (56.1, 64.2)	53.2 (50.3, 56)	62.5 (57, 67.6)	49.4 (46.3, 52.5)

* All differences by hospitalization reports are significantly different, p<.05