

The Coronavirus Disease 2019 Pandemic and Mental Health-Related School-Nurse Visits in United States Schools

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ABSTRACT

OBJECTIVE: No studies have examined school-nurse visits related to mental health (MH) during the coronavirus disease 2019 (COVID-19) pandemic. We examined changes in the rate of MH-related school-nurse visits before and during the COVID-19 pandemic.

METHODS: We analyzed school-nurse visit data ($n = 3,445,240$) for subjects Grade K-12 in US public schools using electronic health record software (SchoolCare, Ramsey, NJ). Data between January 1 and December 31 in 2019 (pre-COVID-19 pandemic) versus January 1 to December 31 in 2020 (during COVID-19 pandemic) were compared. For each year, total visits to a school-nurse were calculated for general MH, anxiety, and self-harm. The exposure was number of school-nurse visits in each time period (2019 vs 2020). The main outcome was change in the rate of general MH, anxiety, and self-harm visits in 2019 versus 2020.

RESULTS: There were 2,302,239 total school-nurse visits in 2019 versus 1,143,001 in 2020. During the COVID-19

pandemic, the rate of visits for general MH increased by 30% (4.7–6.1 per 10,000 visits, 95% confidence interval [CI] {18%, 43%}; $P < .001$), and visits for anxiety increased by 25% (24.8–31 per 10,000 visits, 95% CI [20%,30%]; $P < .001$). There was no significant difference in self-harm visits across all ages during the COVID-19 pandemic.

CONCLUSIONS: Our study found a significant increase in the rate of school-nurse visits for MH and anxiety during the COVID-19 pandemic, suggesting the pediatric population is at-risk for increased negative MH-effects associated with the pandemic and highlights a critical role of school-nurses in identifying youth with potential MH-needs.

KEYWORDS: coronavirus disease 2019; mental health; pediatrics; schools; school-nurse

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WHAT'S NEW

This study is one of the first to assess changes in mental health (MH)-related school-nurse visits during coronavirus disease 2019 (COVID-19). Findings suggest youth are at-risk for increased MH-burden associated with COVID-19 and highlights a role of school-nurses in identifying those with MH-needs.

THE UNITED STATES has witnessed a pediatric mental health (MH) crisis, with up to 20% of children experiencing a diagnosable MH-condition,¹ and coronavirus disease 2019 (COVID-19) exacerbating a perfect storm as stressors to youth have markedly increased during the current

pandemic,^{2,3} exposing deficiencies in our pediatric MH-care system.

Schools play a critical role as the most common point of entry for accessing MH-services to children.⁴ School-nurses are invaluable members of the coordinated student MH-team and play a pivotal role in the provision of MH-services by identifying and triaging at-risk students, providing brief interventions, and arranging referrals to MH-providers in the school and community.⁵ Although school-nurses have an integral position within the school to play a part in the continuum of student MH-care, they are often not fully acknowledged as part of the school MH-team and thus their ability to collaborate with other education and MH professionals in the school has yet to

be completely realized.⁵ To our knowledge, no studies to date have described changes in the rate of school-nurse visits for MH during the COVID-19 pandemic, which is important in understanding the role of school-nurses in addressing pediatric MH-concerns. Although a recent qualitative study provided insights on the experiences of frontline school-nurses during the COVID-19 pandemic,⁶ we conducted this quantitative study using a large nationwide database of school-nurse visits to describe changes in the rate of MH-visits in schools before and during the COVID-19 pandemic, highlighting a critical role of school-nurses in identifying at-risk youth with MH-concerns.

METHODS

We analyzed school-nurse visit data ($n = 3,445,240$) collected from a digital platform (SchoolCare, Ramsey, NJ) which provides digital-health charting for school-nurse visits in public schools Grades K-12 for students aged 4 to 20 years. In schools with in-person instruction in the United States, data were collected through a standardized electronic health encounter template completed by a school-nurse (or those who covered for a nurse in a health office). Reason for visit was entered by selecting from a standardized list (multiple reasons can be entered; if multiple, a primary reason not identified). Students' clinical symptoms were also entered as free text and were not included in our analyses. Data between January 1 and December 31, 2019 (pre-COVID-19 pandemic) versus January 1 to December 31, 2020 (during the pandemic) were compared. For each year, total school-nurse visits were calculated for general MH, anxiety, and self-harm, chosen given they were a more specific proxy for MH from the standardized options for reason for visit. Total

school-nurse visits for headache was also calculated for each year, since headache was the most common reason for visit in 2019 and 2020 and chosen as a general somatic complaint comparator. We used Poisson regression to test the pre- and post-COVID-19 change in the rate of general MH, anxiety, and self-harm visits, with exposure defined as total number of school-nurse visits in each time period. We used Poisson regression to test the pre- and post-COVID-19 pandemic change in the rate of MH and anxiety visits relative to the change in the rate of headaches, where exposure was defined as total number of nurse health visits in each time period. Age was modeled as a continuous variable with linear and quadratic terms. The study was reviewed and approved by Boston Children's Hospital IRB and considered exempt due to a school database of de-identified HIPAA and FERPA-protected data.

Due to unavailable demographic information, we geocoded participating school addresses by using GIS ArcGIS 10.8 software (Environmental Systems Research Institute, Redlands, California) to obtain diversity geographically for schools. A manual review was performed to geocode unmatched addresses. If the address still could not be geocoded, the study observation was excluded from [Figure 1](#), though remained in the analysis.

RESULTS

In total, 651 schools were geocoded during the study period 2019 to 2020 ([Fig. 1](#)), revealing the various states included in the study and geographic diversity of schools throughout the study period.

There were 2,302,239 total school-nurse visits in 2019 and 1,143,001 in 2020. The average age of subjects was 12.0 years (standard deviation = 3.2) in 2019 and 11.3 years (standard deviation = 3.4) in 2020. During the

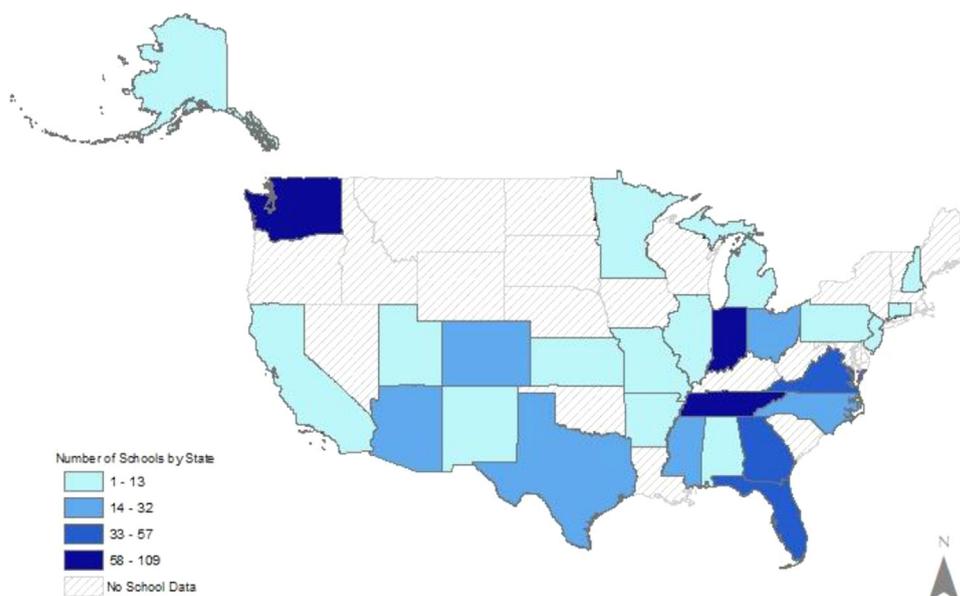


Figure 1. Number of public schools by state (Grade K-12) representing study schools during 2019 to 2020 Study Period. From the available data reviewed for geocoding, there were a total of 714 schools included in the analysis (2019 and 2020). We were able to find addresses for 672 schools, and 651 schools were able to be geocoded.

COVID-19 pandemic, the rate of school-nurse visits for general MH increased by 30% (4.7–6.1 per 10,000 visits, 95% confidence interval [CI] {18%, 43%}; $P < .001$), and visits for anxiety increased by 25% (24.8–31 per 10,000 visits, 95% CI [20%, 30%]; $P < .001$) (Fig. 2a). Rates across age of school-nurse health visits for general MH, anxiety, and self-harm per 10,000 total school-nurse health visits in 2019 and 2020 are shown in Figure 2b. Furthermore, a detailed analysis of age-stratified analysis of rates and rate ratios of visits for MH, anxiety, and self-harm per 10,000 total school-based health visits is summarized in Table.

Headache was the most common reason for visit in 2019 and 2020 (total visits for headache were 266,423 in 2019 and 136,131 in 2020). The rate of headache was 1157 per 10,000 visits (11.6% of all visits) in 2019 versus 1191 per 10,000 visits in 2020 (11.9% of all visits), representing a 3% relative increase in headache ($P < .001$). Our analysis revealed that during the pandemic, visits for anxiety increased by 21% (95% CI [16%–27%]; $P < .001$) and visits for MH increased by 26% (95% CI [14%–38%]; $P < .001$), relative to the 3% increase in school-nurse visits during the pandemic for headache.

Of note, school-nurse visits for self-harm were not significantly increased when analyzed with all ages combined (2.5–2.6 per 10,000 visits, 95% CI [-8%, 21%]; $P = .46$) (Fig. 2a). However, visits for self-harm

significantly increased in younger children (Fig. 2b, Table). Though a small sample size, there was a 530% increase in self-harm among 4-year-olds ($P = .001$) and a 31% increase among 11-year-olds ($P = .008$).

DISCUSSION

To our knowledge, this study is the first to assess changes in school-nurse visits in a large sample of US schools during the COVID-19 pandemic. Our main finding was that the rate of MH and anxiety visits in study schools increased significantly during the pandemic, suggesting increased pediatric MH-burden.

Several studies have shown an increase in symptoms of anxiety and depression among children and adolescents during the COVID-19 pandemic.^{7–10} In a survey distributed to 2111 participants less than 25 years old with diagnosed psychiatric conditions, 83% of participants reported worsening of their psychiatric condition during the pandemic, and 26% reported they were not able to access necessary support services.⁸ In the United Kingdom, a study among children utilizing surveys (Revised Child Anxiety and Depression Scale) revealed a significant increase in depression symptom scores by 75% in evaluations taken before lockdown (June 2018–March 2019, December 2018, September 2019) and during lockdown (April 29–June 19, 2020).⁹

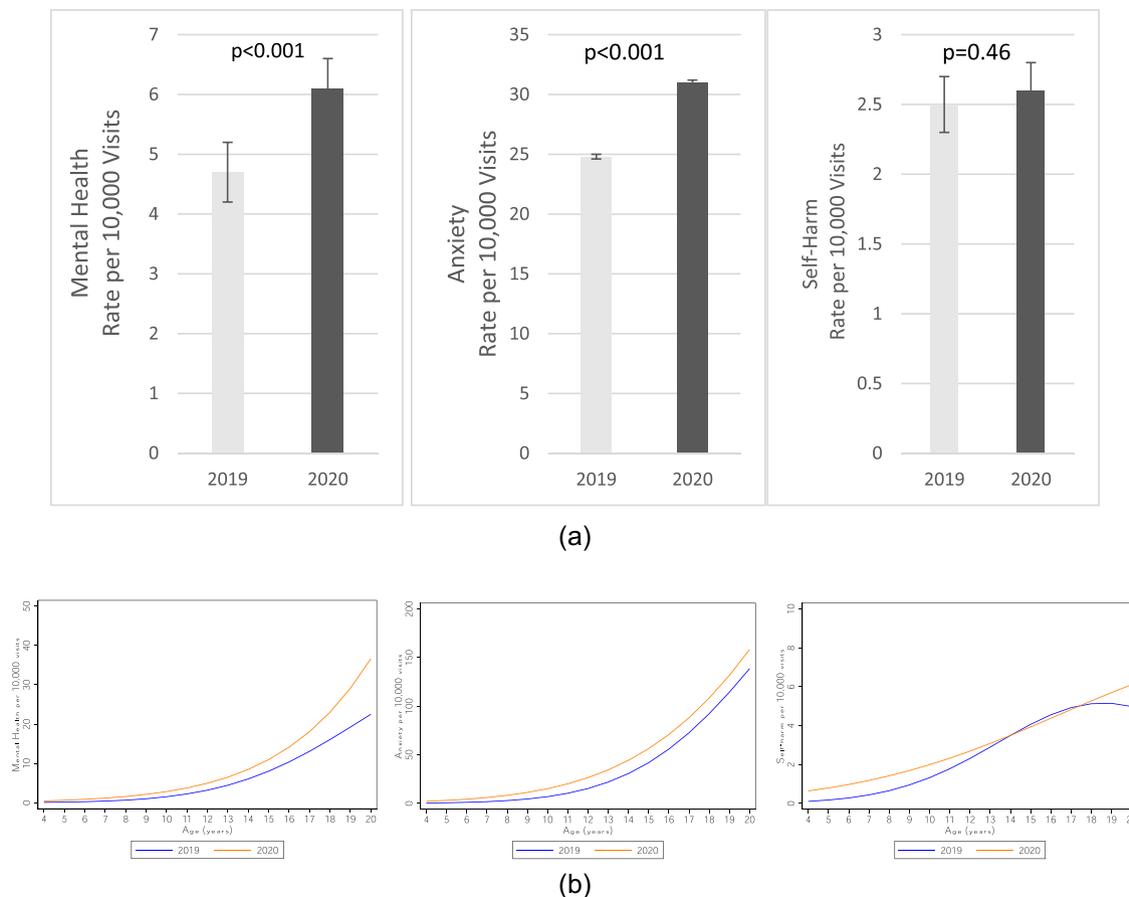


Figure 2. (a) Rate per 10,000 school-nurse visits for mental health, anxiety, and self-harm in 2019 and 2020. Capped lines represent standard errors. (b) Rate across age per 10,000 total school-nurse visits for mental health, anxiety, and self-harm in 2019 and 2020.

Table. Predicted Number of School-Nurse Visits Across Ages (Per 10,000 Total Visits)

Age (years)	Mental Health				Anxiety				Self-Harm			
	2019	2020	IRR	95% CI	2019	2020	IRR	95% CI	2019	2020	IRR	95% CI
4	0.1	0.5	5.2	[2.1, 12.9]**	0.4	2.1	5.9	[3.9, 9.0]**	0.1	0.6	6.3	[2.1, 18.3]**
5	0.2	0.6	4.1	[2.0, 8.7]**	0.6	3.1	4.9	[3.5, 6.8]**	0.2	0.8	4.6	[2.0, 10.8]**
6	0.3	0.9	3.4	[1.9, 6.1]**	1.1	4.3	4.0	[3.1, 5.3]**	0.3	1.0	3.5	[1.8, 6.7]**
7	0.4	1.2	2.8	[1.8, 4.5]**	1.8	6.0	3.4	[2.8, 4.2]**	0.4	1.2	2.7	[1.7, 4.4]**
8	0.7	1.6	2.4	[1.7, 3.4]**	2.9	8.3	2.9	[2.5, 3.4]**	0.7	1.4	2.2	[1.5, 3.1]**
9	1.0	2.1	2.1	[1.6, 2.7]**	4.5	11.2	2.5	[2.2, 2.8]**	0.9	1.7	1.8	[1.4, 2.3]**
10	1.5	2.8	1.9	[1.5, 2.3]**	6.9	15.1	2.2	[2.0, 2.4]**	1.3	2.0	1.5	[1.2, 1.9]**
11	2.2	3.8	1.7	[1.4, 2.0]**	10.4	20.1	1.9	[1.8, 2.1]**	1.8	2.3	1.3	[1.1, 1.6]*
12	3.2	5.0	1.6	[1.3, 1.8]**	15.3	26.5	1.7	[1.6, 1.8]**	2.3	2.7	1.2	[0.96, 1.4]
13	4.4	6.5	1.5	[1.3, 1.7]**	21.9	34.4	1.6	[1.5, 1.7]**	2.9	3.1	1.1	[0.9, 1.3]
14	6.0	8.5	1.4	[1.2, 1.6]**	30.6	44.3	1.4	[1.4, 1.5]**	3.5	3.5	1.0	[0.8, 1.2]
15	8.0	11.0	1.4	[1.2, 1.5]**	41.8	56.3	1.3	[1.3, 1.4]**	4.1	3.9	1.0	[0.8, 1.2]
16	10.4	14.1	1.4	[1.2, 1.5]**	55.8	70.9	1.3	[1.2, 1.3]**	4.6	4.4	1.0	[0.8, 1.2]
17	13.1	18.1	1.4	[1.2, 1.6]**	72.6	88.1	1.2	[1.1, 1.3]**	4.9	4.8	1.0	[0.8, 1.2]
18	16.1	23.0	1.4	[1.2, 1.7]**	92.3	108.4	1.2	[1.1, 1.3]**	5.1	5.3	1.0	[0.8, 1.4]
19	19.2	29.1	1.5	[1.2, 1.9]*	114.5	131.7	1.2	[1.0, 1.3]*	5.2	5.7	1.1	[0.7, 1.7]
20	22.5	36.6	1.6	[1.2, 2.3]*	138.6	158.4	1.1	[1.0, 1.3]*	5.0	6.1	1.2	[0.7, 2.2]

IRR indicates incidence rate ratio; CI, confidence interval.

* $P < .05$.

** $P < .001$.

In our study, it is notable that relative to the 3% increase during the pandemic in visits for headaches, visits for anxiety and MH significantly increased. The increase in school-nurse visits for MH and anxiety is striking given notable decrease in total number school-nurse visits in 2020, raising concern MH-issues may have been underreported due to inability to access school-nurse visits when schools were closed. This finding parallels a study which found the proportion of ED visits for MH-conditions significantly increased during the pandemic, although the mean number of monthly ED MH-visits decreased,¹¹ with similar concern MH-related cases may have been underreported in their study and pediatric MH-burden possibly greater during the pandemic. Analysis for self-harm visits by age revealed a significant number of younger students disproportionately affected, warranting further study on the pandemic's effects on younger children.

Lack of access to child and adolescent psychiatrists and MH-services has been a long-standing concern for families and providers, as wait times for appointments can be many months and families often required to travel long distances.¹² Findings from our study highlight a critical role of school-nurses to help identify and refer youth with potential MH-needs, reducing barriers to MH-services. As schools serve as a sector which all youths have contact, our findings highlight the importance of the school-nurse as a potential common point of entry to identify MH-needs, particularly in the case of youth who may be presenting with their first psychiatric symptoms.⁴

School-nurses are at the forefront in the school-setting as health experts caring for children, identifying students struggling with psychosocial, mental, emotional, or physical issues.¹³ School-nurses spend an estimated 33% of their time addressing student MH-issues,^{5,14} and in one study, over 40% of school-nurses working with

adolescents reported they provided emergency management for a suicidal student in the prior school year.¹⁵ Making appropriate referrals to MH professionals in the school and community is a common school-nurse intervention for a student with MH-concerns.⁵ Given the status of pediatric MH prior to COVID-19 and the current impact of the COVID-19 pandemic, these studies suggest school-nurses, schools, and health professionals partner together to mitigate potentially harmful MH-concerns for children and adolescents.^{16,17}

LIMITATIONS

The calendar year from January 1 to December 31 was compared for each of the 2 years assessed in this study due to limitations in ability to stratify dates from the data source. While the WHO declared COVID-19 a pandemic on March 11, 2020,¹⁸ given heterogeneity throughout the United States when actual lockdown and other COVID-related policies took effect, greater observed changes in the rate of school-nurse visits for MH may have been observed by adjusting our study's timeline of pre-pandemic versus pandemic onset. Since we do not have data from additional years before the pandemic, an alternative explanation for our findings could be that childhood MH-visits were rising even before the pandemic, and this increase was unrelated to the pandemic. However, prior studies have shown between 2016 and 2020, there were significant increases in children's diagnosed depression and anxiety, although after onset of the COVID-19 pandemic specifically, there were significant year-over-year increases in children's diagnosed behavioral or conduct issues, supporting our conclusions that the increase in MH-visits is attributable to factors related to the pandemic.¹⁹

Our study was also limited to schools geographically where in-person learning was available, and did not include children seeking MH-services from providers other than school-nurses, such as school counselors, other school-based MH-providers, or MH-providers outside of school, which may limit the generalizability of our findings. Given the nature of school-nurse services, it is likely the same students may be visiting the school-nurse for MH-related symptoms on more than one occasion; given we did not have access to individual level data to examine this, our analyses used school-nurse visits as observations. The analysis was limited to delineate whether changes in MH-visit rate reflected an increase in MH-need versus a decrease in visits for non-MH issues, however, relative to the increase in school-nurse visits during the pandemic for headache, which was 3%, visits for anxiety and MH increased significantly. We acknowledge that differences in the study population between 2019 and 2020 may confound the study findings and could be further examined by assessing a larger variety of reasons for visit. There was an increase in the number of schools in 2020 compared to 2019 using SchoolCare, and our analysis accounted for this market penetration difference by using a comparison group, which was the headache reason for visit group.

Unfortunately, only data that had been collapsed across all schools was available for analysis. Therefore, we were not able to incorporate clustering at the school level in our models or provide descriptive data at the school level. Figure 1 shows a map of geocoded schools during the study period reflecting the geographic diversity of states included in our analysis. Lack of other available demographic data, such as socioeconomic status, gender, comorbidities, race/ethnicity, and ability to account for clustering within schools warrants need for further study to address potential covariates that may aid in the on-going national conversation of pediatric MH and disparities.

CONCLUSIONS

In this study of students Grade K-12 in study schools, during the COVID-19 pandemic, there was significant increase in the rate of school-nurse visits for MH and anxiety across all ages. Data thus far suggests a significant impact of the COVID-19 pandemic on the psychosocial well-being of the pediatric population and warrants need for further study. Our findings highlight the role of school-nurses to help identify and refer youth with potential MH-needs in the current COVID-19 pandemic and beyond to reduce potential barriers in pediatric MH-care.

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REFERENCES

- O'Connell ME, Boat T, Warner KE. National Research Council (US) and Institute of Medicine (US) Committee on the Prevention of Mental Disorders and Substance Abuse Among Children, Youth, and Young Adults: Research Advances and Promising Interventions. *Preventing Mental, Emotional, and Behavioral Disorders Among Young People: Progress and Possibilities*. Washington, DC: National Academies Press; 2009.
- Meherali S, Punjani N, Louie-Poon S, et al. Mental health of children and adolescents amidst COVID-19 and past pandemics: a rapid systematic review. *Int J Environ Res Public Health*. 2021;18:1–16.
- Charpignon ML, Ontiveros J, Sundaresan S, et al. Evaluation of suicides among US adolescents during the COVID-19 pandemic. *JAMA Pediatr*. 2022;176:724–726.
- Farmer EM, Burns BJ, Phillips SD, et al. Pathways into and through mental health services for children and adolescents. *Psychiatr Serv*. 2003;54:60–66.
- Bohenkamp JH, Stephan SH, Bobo N. Supporting student mental health: the role of the school nurse in coordinated school mental health care. *Psychol Schools*. 2015;52:714–727.
- Lee RLT, West S, Tang ACY, et al. A qualitative exploration of the experiences of school nurses during COVID-19 pandemic as the frontline primary health care professionals. *Nurs Outlook*. 2021;69:399–408.
- Viner R, Russell S, Saullé R, et al. School closures during social lockdown and mental health, health behaviors, and well-being among children and adolescents during the first COVID-19 wave: a systematic review. *JAMA Pediatr*. 2022;176:400–409.
- Lee J. Mental health effects of school closures during COVID-19. *Lancet Child Adolesc Health*. 2020;4:421.
- Bignardi G, Dalmaijer ES, Anwyll-Irvine AL, et al. Longitudinal increases in childhood depression symptoms during the COVID-19 lockdown. *Arch Dis Child*. 2020;106:791–797.
- Duan L, Shao X, Wang Y, et al. An investigation of mental health status of children and adolescents in China during the outbreak of COVID-19. *J Affect Disord*. 2020;275:112–118.
- Krass P, Dalton E, Doupnik SK, et al. US pediatric emergency department visits for mental health conditions during the COVID-19 pandemic. *JAMA Netw Open*. 2021;4: e218533.
- Axelsson D. Meeting the demand for pediatric mental health care. *Pediatrics*. 2019;144:e20192646.
- Stevenson BA. Evolving roles for school nurses: addressing mental health and psychiatric concerns of students. *NASN Sch Nurse*. 2010;25:30–33.
- Stephan SH, Weist M, Kataoka S, et al. Transformation of children's mental health services: the role of school mental health. *Psychiatr Serv*. 2007;58:1330–1338.
- Ramos MM, Greenberg C, Sapien R, et al. Behavioral health emergencies managed by school nurses working with adolescents. *J Sch Health*. 2013;83:712–717.
- Hertz MF, Barrios LC. Adolescent mental health, COVID-19, and the value of school-community partnerships. *Inj Prev*. 2021;27:85–86.
- Hoover S, Bostic J. Schools as a vital component of the child and adolescent mental health system. *Psychiatr Serv*. 2021;72:37–48.
- Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomed*. 2020;91:157–160.
- Lebrun-Harris LA, Ghandour RM, Kogan MD, et al. Five-year trends in US children's health and well-being, 2016–2020. *JAMA Pediatr*. 2022;176:e220056.