Seasonality of Pediatric Mental Health Emergency Department Visits, School, and COVID-19

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Objectives: The aim of this study was to explore how the academic calendar, and by extension school-year stressors, contributes to the seasonality of pediatric mental health emergency department (ED) visits.

Methods: The authors reviewed all pediatric mental health ED visits at a large urban medical center from 2014 to 2019. Patients who were younger than 18 years at time of presentation, were Durham residents, and had a primary payer of Medicaid were included in the sample population, and the dates of ED visits of the sample population were compared against dates of academic semesters and summer/winter breaks of a relevant school calendar. Of patients with multiple ED visits, only the first ED presentation was included, and descriptive statistics and a rate ratio were used to describe the study group and identify the rate of ED visits during semesters compared with breaks.

Results: Among the sample population from 2014 to 2019, there were 1004 first pediatric mental health ED visits. Of these ED visits, the average number of visits per week during summer/winter breaks was 2.2, and the average number of visits per week during academic semester dates was 3.4. The rate of ED visits was significantly greater during academic semesters compared with breaks (Rate Ratio, 1.6; 95% confidence interval, 1.4–2.0; $P < 0.001$).

Conclusions: Children may be at greater risk of behavioral health crises or having increased mental needs when school is in session. As many children's mental health has worsened during the COVID-19 (coronavirus disease 2019) pandemic, these findings highlight the need for increased mental health services in the school setting as children return to in-person learning. In addition, it may benefit health systems to plan behavioral health staffing around academic calendars.

Key Words: COVID-19, mental health, mental health access, school, seasonality

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Pediatric mental illness occurs with severe impairment, substantially interfering with one or more major life activities, in approximately 20% of children and adolescents[1] and leads to significant family burden.[2] In addition, of the 10 leading causes of death among those aged 10 to 24 years, more than 20% are suicide deaths.[3] Nationwide, from 2007 to 2016, there was a 60% increase in emergency department (ED) visits for mental health disorders and a 329% increase in visits for self-harm.[4] Consequently, identifying pediatric mental health risk factors is imperative for the health of children and health systems.

Notably, pediatric mental health visits have a seasonality, increasing in the fall and spring and decreasing in the summer.[5–8] It has been hypothesized that this observed pattern is partly due to unique stressors of the school year and the impact of these stressors on children's mental health.[8] However, demonstrating this association is difficult because school and health system data are not linked, thereby making individual-level data analysis difficult, and school calendars frequently differ within and between school districts, making it inappropriate to apply one school calendar to a heterogeneous group of patients.

In order to account for these statistical challenges and to better understand the impact of school year stressors on mental health ED visits, this study uses a defined patient population, only the first ED visit for patients with multiple ED visits, and exact dates of a relevant school calendar. This study has particular relevance for ED staffing needs, school mental health services, and for anticipating pediatric mental health needs as children return to in-person learning during and after the coronavirus disease 2019 (COVID-19) pandemic.

METHODS

From 2014 to 2019, monthly reports of all pediatric mental health ED visits at Duke University Health System were generated. These reports were reviewed for accuracy and to ensure visits were for mental health reasons. This monthly data included demographic and visit-related variables such as age, sex, race, ethnicity, home city, insurance payer, and ED date of arrival.

From these reports, the sample population was defined as patients who were younger than 18 years at time of presentation, a resident of Durham, and having a primary payer of Medicaid. Because most children who are likely to have Medicaid are in the public school system,[9] and most school-age children in Durham public schools are on a traditional calendar,[10,11] we compared the ED dates of arrival of the sample population to Durham Public School traditional calendar dates for academic semesters and summer/winter breaks. Spring break was not included in the comparison because it is a shorter break, does not occur consistently around the same date, and is during the middle of a semester rather than representing the end of a semester.

Because the available data did not allow a determination of precisely when or for how long a given child met the inclusion criteria for our defined sample population, we had to assume that each child met the inclusion criteria for the entire study period. In addition, because of the uncertainty of when or for how long a given child met the inclusion criteria during the study period and because some children had multiple ED visits, it may have been possible for some children to have multiple visits that were not included in the data (eg, they may have moved out of the district). Consequently, we limited the analysis set to include only the first ED visit for a given child who met the inclusion criteria.

The rate ratio comparing ED visits during semesters versus breaks was tested using PROC GENMOD in SAS 9.4 (SAS Institute, Cary, NC) specifying the Poisson distribution with log link and the natural logarithm of the exposure as an offset term. When a child had multiple ED visits for mental health needs, the rate ratio estimate was tested using only the child's first ED visit.

The Duke University Health System institutional review board approved this study.

RESULTS

From 2014 to 2019, there were 1004 ED visits among the sample population when using only the first ED visit for children

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TABLE 1. Demographics of First Pediatric Mental Health ED Visits for Durham Children With Medicaid From 2014 to 2019

	2014	2015	2016	2017	2018	2019	Total
n	195	165	180	169	162	133	1004
Age, y							
0–4	1	0	1	3	0	0	5
5–9	11	14	20	22	8	11	87
10–14	96	80	77	66	81	66	466
15–17	87	71	82	78	73	55	446
Sex							
Female	104	85	106	92	89	77	553
Male	91	80	74	77	73	56	451
Race							
Black or African American	130	112	115	102	102	75	636
White	34	20	24	33	27	23	161
Asian	0	2	2	1	2	1	8
American Indian or Alaskan Native	0	0	0	1	0	1	2
Native Hawaiian or Other Pacific Islander	0	0	1	1	0	1	3
Not reported/other	31	31	38	31	31	32	194
Ethnicity							
Not Hispanic or Latino	163	133	142	135	132	101	806
Hispanic or Latino	25	24	34	32	23	27	165
Not reported/declined	7	8	4	2	7	5	33

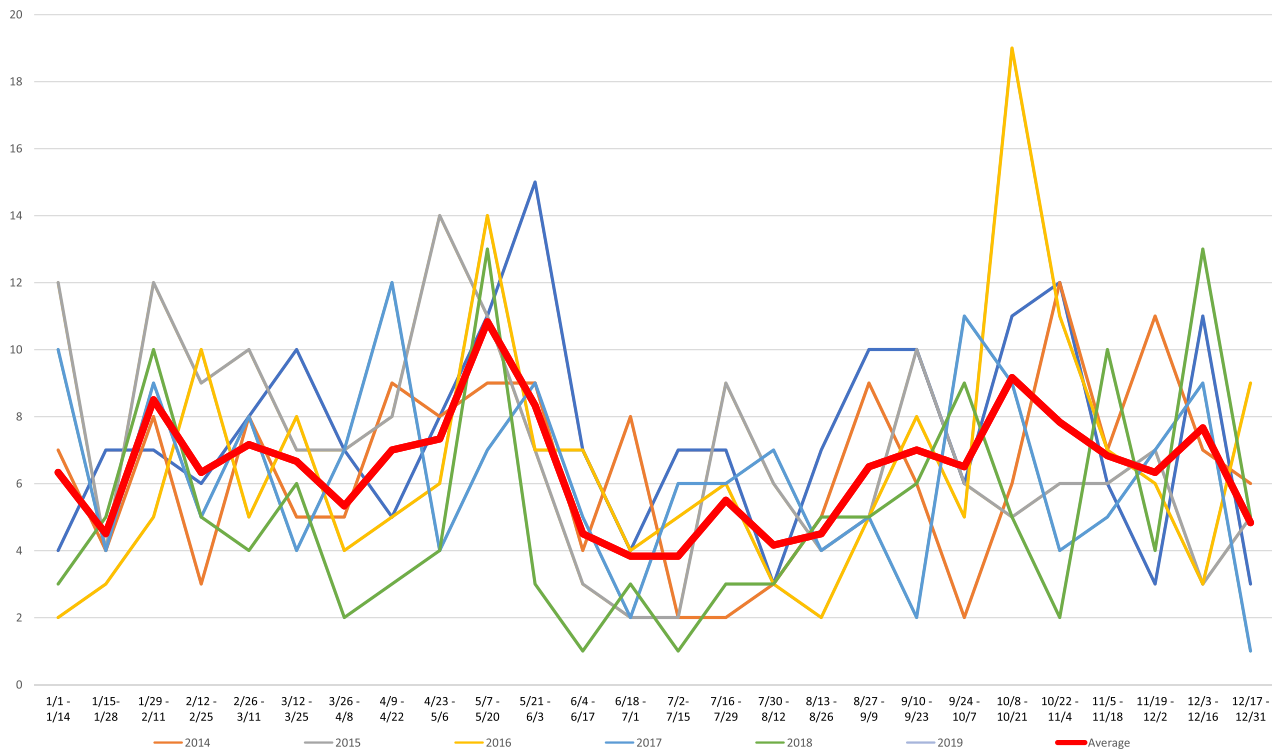

FIGURE 1. Total pediatric mental health ED visits by 2-week intervals. Visits are for Durham children with Medicaid from 2014 to 2019 who arrived at Duke University Health System. Only the first ED visit was used for children with multiple ED visits. Average is the mean number of visits per 2-week interval from all years. Because 2016 was a leap year, the February 26 to March 11 interval in 2016 included 15 days, but no children from the sample presented on February 29. For reference, fall semesters typically started at the beginning of the August 27 to September 9 interval and ended at the beginning of the December 17 to December 31 interval, and spring semesters typically began a few days into the January 1 to January 14 interval and ended a few days into the June 4 to June 17 interval. Winter and summer breaks included all days between academic semesters. Spring break typically occurred during the March 26 to April 8 or April 9 to April 22 intervals.

with multiple ED visits. Of these visits, 63.3% were by Black youth, 80.2% were non-Hispanic/Latino, 55.1% were female, and 90.8% were older than 9 years (Table 1). Comparing the average monthly number of visits nadir, which occurred during the 2-week intervals of June 18 to July 1 and July 2 to July 15, there was a 139% visit increase from October 8 to October 21 and a 183% increase from May 7 to May 20 (Fig. 1). Depending on the year, the October 8 to October 21 interval was approximately 45 days after summer break, and the May 7 to May 20 interval was approximately 125 days after winter break and between approximately 20 to 40 days after spring break (Table 2).

Of 1004 first ED visits from 2014 to 2019, there was an average of 2.2 (SD, 0.8) ED visits per week during summer/winter break and 3.4 (SD, 0.6) during semesters. The rate of ED visits was significantly greater during academic semesters compared with summer/winter break (Rate Ratio, 1.6; 95% confidence interval, 1.4–2.0; $P < 0.001$) (Fig. 2).

TABLE 2. Durham Public School Traditional Calendar Semesters and Breaks for Years 2014–2019

Academic Year	Semester and Breaks	Dates
2013–2014		
	Winter break	1/1/2014–1/5/2014
	Spring semester	1/6/2014–6/10/2014
	Spring break	4/12/2014–4/20/2014
	Summer break	6/11/2014–8/24/2014
2014–2015		
	Fall semester	8/25/2014–12/19/2014
	Winter break	12/20/2014–1/4/15
	Spring semester	1/5/2015–6/9/2015
	Spring break	3/27/2015–4/5/2015
	Summer break	6/10/2015–8/23/2015
2015–2016		
	Fall semester	8/24/2015–12/18/2015
	Winter break	12/19/2015–1/3/2016
	Spring semester	1/4/2016–6/9/2016
	Spring break	3/25/2016–4/3/2016
	Summer break	6/10/2016–8/28/2016
2016–2017		
	Fall semester	8/29/2016–12/22/2016
	Winter break	12/23/2016–1/2/2017
	Spring semester	1/3/2017–6/9/2017
	Spring break	4/8/2017–4/17/2017
	Summer break	6/10/2017–8/27/2017
2017–2018		
	Fall semester	8/28/2017–12/21/2017
	Winter break	12/22/2017–1/12/2018
	Spring semester	1/2/2018–6/7/2018
	Spring break	3/30/2018–4/8/2018
	Summer break	6/8/2018–8/26/2018
2018–2019		
	Fall semester	8/27/2018–12/21/2018
	Winter break	12/22/2018–1/3/2019
	Spring semester	1/4/2019–6/11/2019
	Spring break	3/23/2019–3/31/2019
	Summer break	6/12/2019–8/25/2019
2019–2020		
	Fall semester	8/26/2019–12/20/2019
	Winter break	12/21/2019–12/31/2019

DISCUSSION

Although preliminary and regional, this study suggests children may be at greater risk of mental health crises and increased mental health needs when school is in session. This is consistent with recent data from the United Kingdom demonstrating that school-level variables contributed to variation in the psychopathology of children.[12]

Although some children with mental health needs are likely identified in school settings and subsequently referred to EDs, this seems to be an incomplete explanation for increased ED visits during semesters, given that the bimodal peaks of ED visits occur many weeks to months after the academic semester begins (Fig. 1, Table 2). If this pattern of ED visits was entirely explained by school identification of student mental health needs and subsequent ED referral, we would likely see a bolus of ED referrals at the beginning of the academic year. Instead, it is possible that unique stressors of the school year accumulate during the semester and lead to increased behavioral health crises and mental health needs.

Despite school being a source of support and development for many children,[13] for some, this setting is associated with unique stressors. Academic pressure and performance have been reported to be the greatest source of stress for children and adolescents.[14,15] In addition, bullying and peer victimization, which are associated with adverse mental health outcomes (eg, anxiety, depression), frequently occur in the academic setting.[16,17] Also, school may be particularly challenging for children with a social anxiety disorder, leading to school avoidance and worsened mental health,[18] and school climate has been shown to impact childhood mental health.[19] It is possible that the culmination of these and other stressors may lead to mental health crises and subsequent presentation to the ED.

However, school can also be an important place for improving pediatric mental health. Indeed, offering mental health services in the school setting is effective, captures nearly all children, brings care to students, improves access, and decreases mental health stigma.[20–22] In addition, improving school climate has been identified as a universal intervention to reduce pediatric mental illness.[12,19]

During the COVID-19 pandemic, it has been documented that some children's mental health has worsened,[23–26] and as children return to in-person learning, it will be important for schools to monitor and manage the mental health needs of children. In addition, based on this research, the confluence of worsened mental health of some children during the COVID-19 pandemic and the start of a new academic semester may lead to increased behavioral health crises and needs compared with previous years. It is this combination of factors that has led some to call for an increased focus on behavioral health interventions in the educational system.[27]

Fortunately, with the American Rescue Plan Act including $80 million for mental health care access[26] and other federal legislation directly proposing increased mental health access in schools,[28] the value of pediatric mental health services, particularly in the school setting, is increasingly being recognized. However, it will be crucial for these dollars to go to evidence-based services and to provide increased resources in the school setting to manage mental health concerns.

Finally, based on these data, it may be helpful for health systems and EDs to staff accordingly around academic semesters and breaks and to be aware that pediatric mental health staffing needs may increase as children return to school during and after the COVID-19 pandemic.

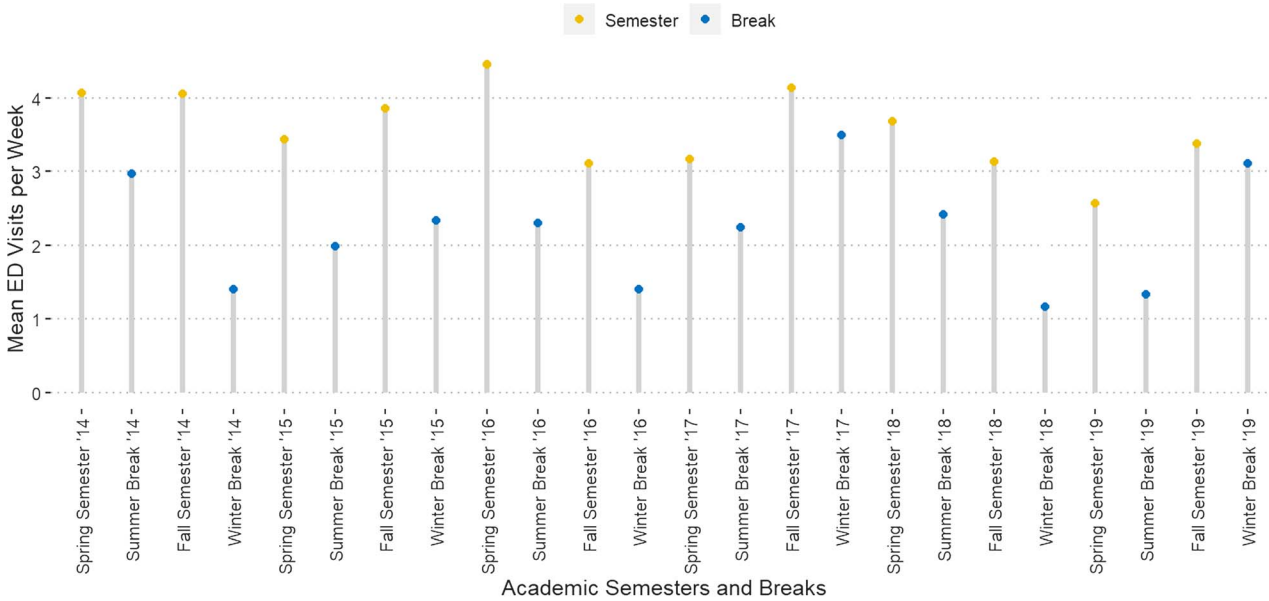

FIGURE 2. Pediatric mental health emergency department visits during traditional school semesters and summer/winter breaks. Graph displays mean visits per week for Durham children with Medicaid using only the first mental health ED visit per child from 2014 to 2019 at Duke University Health System. Semesters and breaks were defined for respective years using the exact dates of Durham Public School traditional calendars. The rate of ED visits was significantly greater during academic semesters compared with breaks (Rate Ratio, 1.6; 95% confidence interval, 1.3–1.9; $P < 0.001$).

Important limitations to this study include its focus on a single geographic area, use of a single school district calendar, capturing only the first mental health ED visit of a given child, and not knowing the total population of students at any given time. In addition, because of necessary student privacy laws, there is limited access to individual student-level data or data on children who did not have an ED visit. An electronic link between school and health system data, which has been developed in other countries,[29] would be an important innovation in the United States to accurately describe and identify the risks of school-related variables on pediatric mental health, and the development and discoveries of this link could guide future research and interventions.

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