

# Hospitalization for Suicide Ideation or Attempt: 2008–2015

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abstract

**OBJECTIVES:** Suicide ideation (SI) and suicide attempts (SAs) have been reported as increasing among US children over the last decade. We examined trends in emergency and inpatient encounters for SI and SA at US children's hospitals from 2008 to 2015.

**METHODS:** We used retrospective analysis of administrative billing data from the Pediatric Health Information System database.

**RESULTS:** There were 115 856 SI and SA encounters during the study period. Annual percentage of all visits for SI and SA almost doubled, increasing from 0.66% in 2008 to 1.82% in 2015 (average annual increase 0.16 percentage points [95% confidence intervals (CIs) 0.15 to 0.17]). Significant increases were noted in all age groups but were higher in adolescents 15 to 17 years old (average annual increase 0.27 percentage points [95% CI 0.23 to 0.30]) and adolescents 12 to 14 years old (average annual increase 0.25 percentage points [95% CI 0.21 to 0.27]). Increases were noted in girls (average annual increase 0.14 percentage points [95% CI 0.13 to 0.15]) and boys (average annual increase 0.10 percentage points [95% CI 0.09 to 0.11]), but were higher for girls. Seasonal variation was also observed, with the lowest percentage of cases occurring during the summer and the highest during spring and fall.

**CONCLUSIONS:** Encounters for SI and SA at US children's hospitals increased steadily from 2008 to 2015 and accounted for an increasing percentage of all hospital encounters. Increases were noted across all age groups, with consistent seasonal patterns that persisted over the study period. The growing impact of pediatric mental health disorders has important implications for children's hospitals and health care delivery systems.

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**WHAT'S KNOWN ON THIS SUBJECT:** Over the last decade, increases in suicide and depression have been reported in US children in outpatient settings, and the number of children hospitalized with a primary mental health diagnosis also appears to be increasing.

**WHAT THIS STUDY ADDS:** With this study, we provide data on recent trends in hospital visits for suicide attempts and ideation in children seeking care at children's hospitals, examining demographic as well as longitudinal and seasonal trends.

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Suicide remains the third leading cause of death in US adolescents.<sup>1</sup> Age-adjusted suicide rates among youth have risen by 24% over the last 15 years.<sup>2</sup> Suicide ideation (SI) and suicide attempts (SAs) are associated with increased risk of repeat attempts as well as subsequent death. Up to 27% of children and adolescents ages 10 to 18 years who present with a first SA will have a second one.<sup>3,4</sup> During the first year after medical evaluation for SA, up to 2% of adult patients will die by suicide.<sup>5–10</sup> Although the risk of death appears to be lower for children and adolescents, rehospitalization for children and adolescents with mood disorders <18 years of age within the first year after admission is common, and self-injury is a strong predictor of readmission.<sup>11–13</sup>

It is well recognized that the outpatient child and adolescent mental health workforce remains inadequate,<sup>14–16</sup> and emergency departments (EDs) and acute care hospitals often provide a critical safety net for youth experiencing SI and/or SA.<sup>17–19</sup> In 2009, near the start of our study period, primary mental health diagnoses accounted for 3% of all hospitalizations at freestanding children's hospitals.<sup>19</sup> Although children's hospitals serve as regional referral centers of expertise for many pediatric physical health conditions, little is known about their role in providing SI and/or SA care at a time when national rates of youth suicides appear to be increasing. Many pediatric hospitals have reported shortages of mental health clinicians over the last decade,<sup>20,21</sup> and pediatricians report lack of adequate training and skills to manage mental health complaints.<sup>22–24</sup> With our study, we sought to examine changes over time in (1) the burden of SI and SA encounters at children's hospital EDs and inpatient units and (2) the demographic and clinical

characteristics of these children, as well as trends.

## METHODS

### Study Population

We used the Pediatric Health Information System (PHIS) database (Children's Hospital Association, Lenexa, KS), which contains clinical and billing data from 49 children's hospitals in the United States, to identify ED encounters, observation stays, and inpatient hospitalizations for children and adolescents 5 to 17 years of age between 2008 and 2015 using current procedural terminology codes. Member hospitals represent 17 of the 20 major metropolitan areas across the United States. Hospitals with incomplete PHIS data during the study period were excluded. Encounters with  $\geq 1$  primary or secondary discharge diagnosis codes (*International Classification of Diseases, Ninth Revision*) were classified as SI by using the V62.84 code (suicidal ideation). Encounters were classified as SA by using an algorithm previously validated in children and adolescents that used external cause-of-injury codes (E-codes 950–959) and *International Classification of Diseases, Ninth Revision, Clinical Modification* codes corresponding to potential mechanisms or injuries resulting from suicidal behavior (Supplemental Table 2).<sup>25</sup> This algorithm, derived from administrative claims data, produced a high positive predictive value (85%) for suicidal behavior, particularly with episodes resulting in hospitalization. Complex chronic conditions (CCCs) were also identified by using a separate previously validated algorithm to examine any trends among children and adolescents with CCCs, specifically patients classified as having technology dependence or organ transplant.<sup>26</sup>

### Outcome

The outcome was the percentage of total encounters for SI and SA in each month of the study period. This was calculated by dividing the number of SI and SA encounters by the total number of encounters in each month.

### Analysis

We summarized characteristics of the population using frequencies and percentages for categorical variables and median and interquartile ranges (IQRs) for continuous variables. We examined monthly trends in SI and SA encounters across the study period using an autoregressive integrated moving average linear regression model to account for first order autocorrelation in the error terms of consecutive observations and clustered on hospital. This model also included a term for calendar month to account for postulated seasonal fluctuations in encounters for SI and SA. Using this model, we calculated the average annual change in the percentage of SI and SA encounters over the study period, and we compared the absolute difference in the percentage of SI and SA encounters between 2015 and 2008. We created secondary models for subgroups defined by age (5–11, 12–14, and 15–17 years), sex, and race and/or ethnicity. Age subgroups were based on commonly accepted definitions for late childhood, early, and late adolescence.<sup>27</sup>

To examine seasonal trends in SI and SA encounters, we calculated the mean percentage of annual SI and SA encounters in each calendar month and seasonal quarter. Finally, we calculated the mean absolute difference in the percentage of annual SI and SA cases in each quarter from the quarter with the lowest mean percentage of annual SI and SA cases as the reference (summer). All analyses were performed by using SAS version 9.4 (SAS Institute, Inc, Cary, NC), and a  $P < .05$  was considered statistically

significant. This study was approved by the Institutional Review Board at Vanderbilt University Medical Center.

## RESULTS

### Study Population

During the study period, we identified 115 856 encounters for SI and SA, representing 1.21% of the 9 574 229 total encounters across 31 hospitals (Table 1). More than half of SI and SA encounters resulted in an inpatient hospitalization in a children's hospital ( $n = 67 588$ ; 58.3%); of these, 8913 (13.2%) required intensive care. Half of encounters were adolescents 15 to 17 years old ( $n = 58 160$ ; 50.2%), 42 844 were 12 to 14 years (37%), and 14 852 were 5 to 11 years (12.8%). Girls composed nearly two-thirds of encounters ( $n = 74 599$ ; 64.4%).

### Trends in SI and SA Encounters

SI and SA encounters, expressed as a percentage of total annual encounters per year, more than doubled over the study period, increasing from 0.66% in 2008 to 1.82% in 2015 (absolute difference in percent: 1.16; 95% confidence interval [CI]: 1.13 to 1.18;  $P < .001$ ). This represented an average annual increase of 0.16 percentage points (95% CI 0.15 to 0.17;  $P < .001$ ) (Fig 1). Over this period, total annual encounters for all diagnoses increased from 9 639 19 to 1 376 498 encounters (an increase of 43%), and total annual encounters for SI and SA increased from 6392 to 25 085 encounters (an increase of 292%); increases were seen in both ED and inpatient settings, with slightly higher increases noted in ED encounters, compared with inpatient encounters (Supplemental Table 3). Significant increases were noted across all 3 age groups (Fig 2, Supplemental Table 4) but were lower for 5- to 11-year-olds (average annual increase 0.02 percentage points [95% CI 0.01 to 0.02])

**TABLE 1** Characteristics of the Study Population, 2008–2015 ( $N = 115 856$ )

Characteristic	Total	2008–2011	2012–2015
All encounters	9 574 229	4 361 695	5 212 534
SI and SA encounters	115 856	35 266 (30.4)	80 590 (69.6)
Percentage of all encounters classified as SI or SA	1.21%	0.81%	1.55%
Patient type			
Inpatient	67 588 (58.3)	21 512 (61)	46 076 (57.2)
ED	48 268 (41.7)	13 754 (39)	34 514 (42.8)
ICU	8913 (7.7)	3104 (8.8)	5809 (7.2)
Age group			
5–11 y	14 852 (12.8)	4703 (13.3)	10 149 (12.6)
12–14 y	42 844 (37)	11 967 (33.9)	30 877 (38.3)
15–17 y	58 160 (50.2)	18 596 (52.7)	39 564 (49.1)
Median age (IQR)	15 (13, 16)	15 (13, 16)	14 (13, 16)
Sex			
Boy	41 239 (35.6)	13 908 (39.4)	27 331 (33.9)
Girl	74 599 (64.4)	21 353 (60.5)	53 246 (66.1)
Race and/or ethnicity			
Non-Hispanic white	67 101 (57.9)	19 844 (56.3)	47 257 (58.6)
Non-Hispanic African American	23 858 (20.6)	8055 (22.8)	15 803 (19.6)
Hispanic	13 381 (11.5)	3657 (10.4)	9724 (12.1)
Other	11 516 (9.9)	3710 (10.5)	7806 (9.7)
CCC <sup>a</sup>	9313 (8)	2895 (8.2)	6418 (8)
Payer			
Government	59 973 (51.8)	18 240 (51.7)	41 733 (51.8)
Private	51 034 (44)	13 819 (39.2)	37 215 (46.2)
Other	4849 (4.2)	3207 (9.1)	1642 (2)
Median household income <sup>b</sup>			
Quartile 1	27 903 (24.1)	9289 (26.3)	18 614 (23.1)
Quartile 2	35 358 (30.5)	10 620 (30.1)	24 738 (30.7)
Quartile 3	37 565 (32.4)	10 918 (31)	26 647 (33.1)
Quartile 4	12 885 (11.1)	3804 (10.8)	9081 (11.3)
Median distance traveled (IQR) <sup>c</sup>	10.9 (5.6, 20.2)	10.2 (5.4, 19.7)	11.1 (5.7, 20.2)
No. and % of children traveling >20 miles	28 950 (25)	8644 (24.5)	20 306 (25.2)
Length of stay, d			
0–1	62 716 (58.3)	18 717 (53.1)	43 999 (54.6)
2–3	14 909 (12.9)	4607 (13.1)	10 302 (12.8)
4–6	19 921 (17.2)	5545 (15.7)	14 376 (17.8)
>7	18 310 (15.8)	6397 (18.1)	11 913 (14.8)
Season			
Spring	32 807 (28.3)	9931 (28.2)	22 876 (28.4)
Summer	21 314 (18.4)	6613 (18.8)	14 701 (18.2)
Fall	32 593 (28.1)	9918 (28.1)	22 675 (28.1)
Winter	29 142 (25.2)	8804 (25)	20 338 (25.2)

Values expressed as total number and percentage unless otherwise specified.

<sup>a</sup> Ref 26.

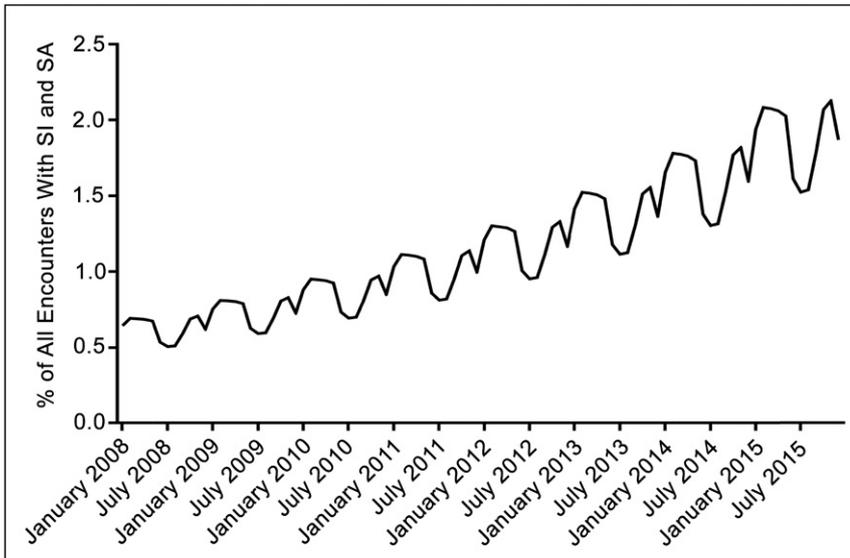
<sup>b</sup> Data missing for 2145 encounters (1.9%).

<sup>c</sup> The distance traveled was calculated as the linear distance between the centroid of each patient's residential zip code and the centroid of the hospital's zip code.

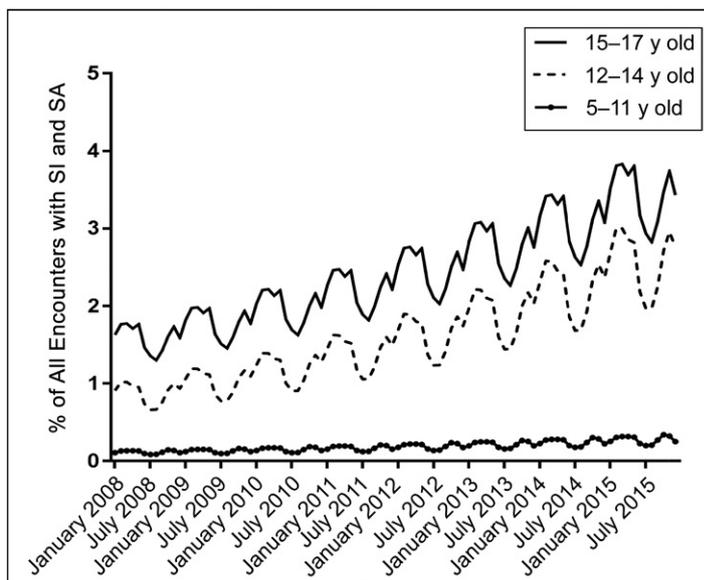
compared with 12- to 14-year-olds (average annual increase 0.25 percentage points [95% CI 0.21 to 0.27]) and 15- to 17-year-olds (average annual increase 0.27 percentage points [95% CI 0.23 to 0.30]) ( $P < .001$  for both comparisons). Significant increases were seen in both girls (average annual increase 0.14 percentage

points [95% CI 0.13 to 0.15]) and boys (average annual increase 0.10 percentage points [95% CI 0.09 to 0.11]), but were higher for girls ( $P < .001$ ) (Fig 3, Supplemental Table 5).

Regarding race and ethnicity, increases in SI and SA encounters were seen across all age groups. Increases as a total percentage of all SI and SA encounters were highest in



**FIGURE 1**  
Trends in encounters for SI and SA across 31 children's hospitals, 2008–2015.



**FIGURE 2**  
Trends in encounters for SI and SA across 31 children's hospitals by age group, 2008–2015.

non-Hispanic white youth (average annual increase 0.18 percentage points [95% CI 0.16 to 0.20], followed by youth of other races (average annual increase 0.09 percentage points [95% CI 0.07 to 0.11]), non-Hispanic African American youth (average annual increase 0.09 percentage points [95% CI 0.08 to 0.10]), and Hispanic youth (average annual increase 0.05 percentage points [95% CI 0.04 to 0.06]) (Fig 4,

Supplemental Table 6). When we examined trends in socioeconomic status (defined as median household income by quartiles), the lowest quartile (1) was the only subgroup to reveal a slight decrease over the study period (26.3% in 2008, compared with 23.1% in 2015). All other subgroups (quartile 2, quartile 3, and quartile 4) revealed slight increases, with the largest increase seen in quartile 3 (Table 1). We

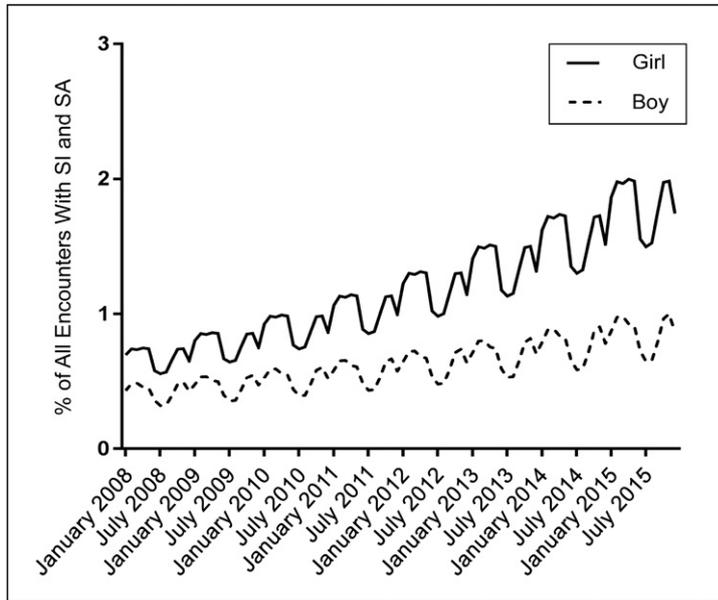
also examined geographic trends over the study period using the patients' zip code. Although median distance traveled for encounter increased slightly over this period, the percentage of children traveling >20 miles for each encounter did not significantly increase over time (Table 1). Regarding patient type, inpatient encounters composed the majority of encounters (58.3%) compared with ED encounters (41.7%). Length of stay was examined by subgroup. Over half of all encounters fell into the 0- to 1-day subgroup, although a substantial proportion (15.8%) composed the >7-days group, requiring prolonged hospitalization. A total of 7.7% of patients were admitted to ICU, with only a slight decrease noted over the period studied.

### Seasonal Variation in Suicidality Encounters

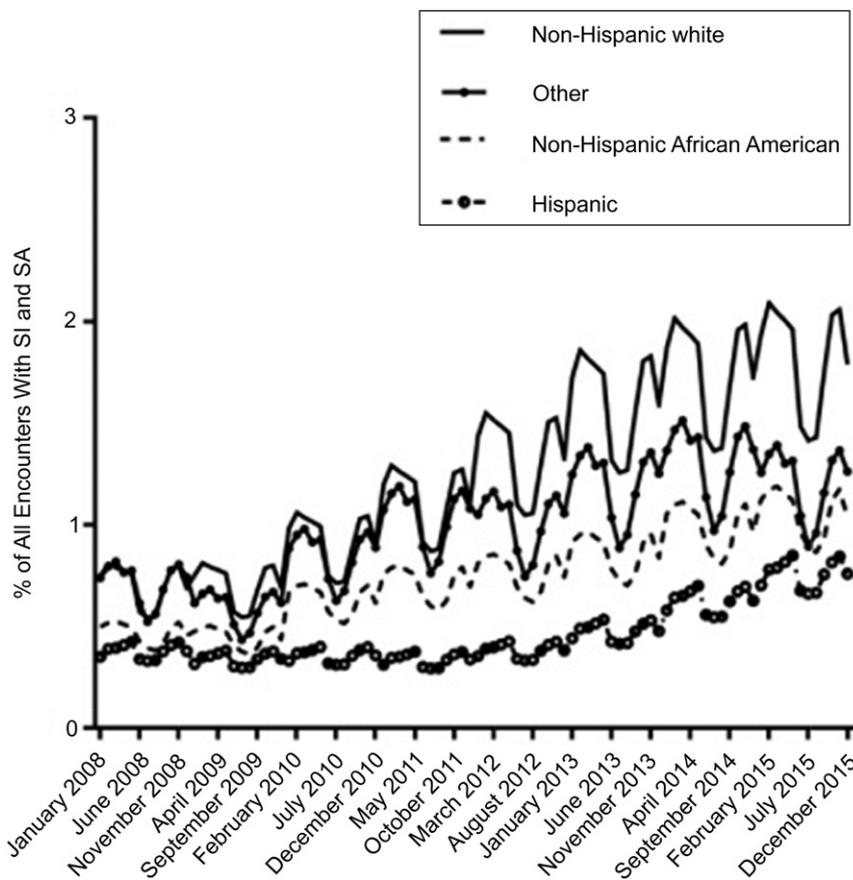
We observed seasonal variation in encounters for SI and SA (Fig 5). The lowest frequency of encounters occurred during summer months. On average, during the 8 years included in the study, only 18.5% (95% CI 18.0 to 19.0) of total annual SI and SA encounters occurred during summer months. July only accounted for 5.9% of all SI and SA encounters (95% CI 5.6 to 6.1). Peaks were highest in fall and spring. October accounted for nearly twice as many encounters as reported in July (9.9% [95% CI 9.2 to 10.7]), followed by March (9.7% [CI 9.2 to 10.1]) (Fig 4, Supplemental Table 7).

### DISCUSSION

Encounters for SI and SA encounters more than doubled between 2008 and 2015. More than half of these resulted in hospitalization. The observed increases appear to be consistent with reports of increasing prevalence of depression and mood disorders in US children and adolescents.<sup>28</sup> Suicide deaths among 10- to 14-year-olds significantly



**FIGURE 3** Trends in encounters for SI and SA across 31 children's hospitals by sex, 2008–2015.



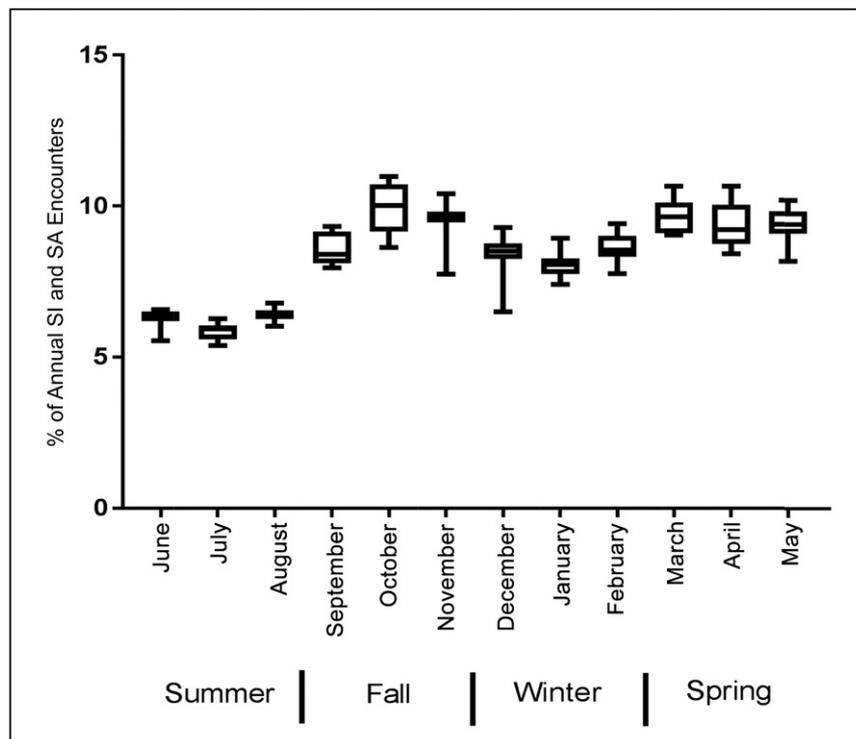
**FIGURE 4** Trends in encounters for SI and SA across 31 children's hospitals by race and/or ethnicity, 2008–2015.

increased from 2006 to 2014, a time period similar to the one we examined; according to data from the Centers for Disease Control and Prevention, suicide is now as common a cause of death as motor vehicle accidents in this age.<sup>29,30</sup>

Previous SAs have been shown to be a significant predictor of future attempts in children and adolescents. We did not specifically examine suicide deaths or differentiate between SI and SA encounters, but increases in SI and SA encounters were seen across all age groups. Greatest increases in SI and SA encounters were seen among 12- to 14-year-olds and 15- to 17-year-olds but were also noted among 5- to 11-year-olds. Although suicide in elementary school children is rare, the authors of 2 recent studies of children aged 5 to 11 years have suggested these rates may be increasing, particularly among African American boys.<sup>31,32</sup>

Previously reported data has revealed that adolescent girls appear to be at increasing risk for SI, SA, and mood disorders. Larger increases in depressive symptoms in 12- to 17-year-old girls, compared with boys, have also been reported from 2005 to 2014.<sup>28</sup> We noted a similar increase in the percent of SI and SA encounters in girls, compared with boys. These findings have important implications for exploring age- and sex-specific approaches to suicide screening and prevention interventions, as well as further research in examining causal factors for SI and SA.

Most studies still reveal an overall higher risk for suicidal behavior among white youth than any other group,<sup>33</sup> similar to the findings in our study. We did not see dramatic shifts among race and ethnicity over the study period, but we did not specifically examine race by age or sex subgroups and acknowledge we only studied individuals who sought care for SI and/or SA;



**FIGURE 5**  
Seasonal trends in encounters for SI and SA across 31 children's hospitals, 2008–2015.

cultural and economic barriers to seeking mental health care remain important considerations. Average distance traveled and the percentage of children traveling >20 miles for care did increase slightly over this study period, but we did not examine specific geographic trends more closely. Although children's hospitals included in the PHIS database often serve a large geographic area, general hospitals have historically carried a larger burden of pediatric hospitalizations for mental health disorders compared with those in the PHIS database,<sup>19</sup> and we are unable to make any conclusions regarding geographic trends over the study period.

Several reasons have been suggested for the growing increase in depression, SI and SA, and suicide among children and adolescents. Bullying<sup>34,35</sup> (particularly the rise of social media and cyberbullying<sup>36,37</sup>), the decreasing age of puberty in girls,<sup>38,39</sup> and trends in the use of antidepressants<sup>40</sup> have been

proposed as possible factors. The effect of the economic crisis of 2008 has also been examined, although its effect on adolescent suicide-related behavior remains less understood than adult behavior.<sup>41–43</sup> We did not observe any significant trends between quartiles of median household income or changes in payer mix over the study period.

Most striking was the marked seasonal variation in percentage of total SI and SA encounters we observed throughout the study period. July had the lowest mean percentage of annual cases (5.9%), followed by June and August. Summer months accounted for a mean 18.5% of annual cases; percentages nearly doubled in spring and fall months. Assuming that the majority of SI and SA encounters represented children who were enrolled in traditional academic calendars, rates of SI and SA encounters were higher during the academic year, compared with summer months. To our

knowledge, only one other previous study in the medical literature has reported a correlation between risk of SI and SA among children and adolescents and the academic school year.<sup>44</sup> Lueck et al<sup>44</sup> found an incidence rate ratio of 2.18 for ED visits related to psychiatric complaints (including SI, SA, homicidal ideation, and involuntary psychiatric holds) during school attendance compared with school vacation times. Hansen and Lang<sup>45</sup> reviewed mortality data from 1980 to 2004 and concluded that youth suicides were least likely to occur in months when students were on summer vacation, whereas adult suicide is most likely to occur during those same months,<sup>46,47</sup> suggesting that youth may face increased stress and decreased mental health when school is in session. Recent media attention has been focused on how schools and social media impact behavior and the role social contagion may play.<sup>48,49</sup> With our findings, we underscore the need for future work to explore the relationship between school and suicidal ideation, recognizing that the role of academics is a complex one, and there may also be other additional influences at play regarding seasonality.<sup>50,51</sup>

One question raised by our study is whether the overall increase and seasonal variation in SI and SA encounters represent true differences in increasing incidence of SI and SA or reflect improved recognition and screening. The use of both outpatient and inpatient specialty mental health care services increased during the time period we studied.<sup>50,51</sup> Reported in data from the National Surveys on Drug Use and Health was an increase in 12-month prevalence of major depressive episodes, a strong predictor for SI and SA, among 12- to 17-year-olds from 2005 to 2014.<sup>28</sup> In addition,

suicide incidence rates increased for all age groups over this period, including 10- to 17-year-olds.<sup>29</sup> Thus, it seems plausible that the increase in SI and SA encounters are more reflective of general trends reported in the community prevalence of SI and SA, although other factors, such as declining availability (and increased use) of inpatient psychiatric beds may have also contributed. Much emphasis has been placed on improved screening for youth depression and SI in primary care,<sup>52,53</sup> recognizing the crucial role primary care providers play in providing appropriate evaluation and treatment. However, less than half of young people with a mental disorder seek treatment,<sup>54</sup> and current literature suggests only a minority of individuals affected with depression receive care.<sup>55,56</sup> Only a minority of pediatricians report that they feel comfortable treating depression.<sup>22–24</sup> If pediatricians are screening patients for depression and SI more often but are not equipped to manage these conditions, they may be more likely to refer these patients to higher levels of care, including children's hospitals, to access mental health care.

Several limitations of our study warrant consideration. It is possible that some nonsuicidal self-harm encounters were misclassified as SI and/or SA. Nonsuicidal self-harm appears to be increasing among adolescents.<sup>57,58</sup> The algorithm we used to identify SI and SA encounters previously revealed a high positive predictive value (82.6%), but we acknowledge it was derived from youth enrolled in Medicaid from a single state; thus, it may not be generalizable to youth in other states to those with other insurance coverage. Although individuals with nonsuicidal self-harm are less likely to present for emergency care or hospitalization,<sup>59</sup> we acknowledge

considerable overlap exists between these 2 populations.<sup>60,61</sup> Nevertheless, increases in either group raises cause for concern. The rate of increase in the identification of SI using the V62.84 code is similar to rates of increase reported in other studies in which authors examine other data sources. Although this code was introduced in 2006 and initially resulted in a marked increase in recorded suicidal ideation among ED visits,<sup>62</sup> we chose to begin our study period in 2008 to minimize measurement artifacts related to time lag in implementation of new *International Classification of Diseases, Ninth Revision* codes. For similar reasons, we chose to end our study period in 2015 when new *International Classification of Diseases, 10th Revision* codes for SI were introduced and included corresponding *International Classification of Diseases, 10th Revision* codes for October through December of 2015.

The PHIS database is limited to freestanding children's hospitals; thus, our findings are only applicable to these hospitals. Authors of future studies that include data from community hospitals could help corroborate whether similar trends have occurred in community hospital settings. The ecological design of our study precluded assessment of biological or psychosocial factors contributing to SI and SA. In addition, we did not differentiate encounters between SI and SA, and we were also unable to determine whether the increasing trends observed reflected increases in incident SI and SA, recurrent SI and SA, or both. We did not examine completed suicides or readmissions for SI and SA, which are important correlates for SI and SA. Finally, we were unable to examine referral sources for children and adolescents directed to children's hospitals for evaluation or disposition at discharge.

## CONCLUSIONS

Our findings that ED and inpatient children's hospital encounters for SI or SA have increased over the past decade underscore the increasing impact of mental health disorders in youth on children's hospital services and the increasing role they appear to play in managing and treating youth with SI or SA. We hope our study can be used to inform future effective strategies for managing the growing burden of children with behavioral health issues. Children's hospitals are unique in that many sites serve as primary training locations for a variety of pediatric health and behavioral health care providers. They are well positioned to help explore future interventions and research in quality improvement as well as to advocate for access to pediatric mental health care. In addition, the finding that SI and SA encounters occur more often during the academic school year underscores the need for further research in the role that schools may play as well as inform hospital capacity planning and workflow. Recognition of this increasing burden on children's hospitals is paramount in helping to inform future strategies for suicide prevention and treatment and to ensure that interventions to reverse this concerning trend continue to reach the individuals at highest risk.

## ABBREVIATIONS

CCC: complex chronic condition  
 CI: confidence interval  
 ED: emergency department  
 IQR: interquartile range  
 PHIS: Pediatric Health Information System  
 SA: suicide attempt  
 SI: suicide ideation

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## REFERENCES

1. Kochanek KD, Xu J, Murphy SL, Miniño AM, Kung HC. Deaths: preliminary data for 2009. *Natl Vital Stat Rep*. 2011;59(4):1–51
2. Curtin S, Warner M, Hedegaard H. *Increase in Suicide in the United States, 1999-2014*. Hyattsville, MD: National Center for Health Statistics; 2016. Available at: [www.cdc.gov/nchs/data/databriefs/db241.pdf](http://www.cdc.gov/nchs/data/databriefs/db241.pdf). Accessed November 7, 2016
3. Hawton K, Bergen H, Kapur N, et al. Repetition of self-harm and suicide following self-harm in children and adolescents: findings from the Multicentre Study of Self-harm in England. *J Child Psychol Psychiatry*. 2012;53(12):1212–1219
4. Rosenbaum Asarnow J, Berk M, Zhang L, Wang P, Tang L. Emergency department youth patients with suicidal ideation or attempts: predicting suicide attempts through 18 months of follow-up. *Suicide Life Threat Behav*. 2017;47(5):551–566
5. Gunnell D, Hawton K, Ho D, et al. Hospital admissions for self harm after discharge from psychiatric inpatient care: cohort study. *BMJ*. 2008;337:a2278
6. Owens D, Horrocks J, House A. Fatal and non-fatal repetition of self-harm. Systematic review. *Br J Psychiatry*. 2002;181:193–199
7. Hawton K, Zahl D, Weatherall R. Suicide following deliberate self-harm: long-term follow-up of patients who presented to a general hospital. *Br J Psychiatry*. 2003;182(6):537–542
8. Madsen T, Agerbo E, Mortensen PB, Nordentoft M. Deliberate self-harm before psychiatric admission and risk of suicide: survival in a Danish national cohort. *Soc Psychiatry Psychiatr Epidemiol*. 2013;48(9):1481–1489
9. Tidemalm D, Beckman K, Dahlin M, et al. Age-specific suicide mortality following non-fatal self-harm: national cohort study in Sweden. *Psychol Med*. 2015;45(8):1699–1707
10. Runeson B, Haglund A, Lichtenstein P, Tidemalm D. Suicide risk after nonfatal self-harm: a national cohort study, 2000-2008. *J Clin Psychiatry*. 2016;77(2):240–246
11. Blader JC. Symptom, family, and service predictors of children's psychiatric rehospitalization within one year of discharge. *J Am Acad Child Adolesc Psychiatry*. 2004;43(4):440–451
12. James S, Charlemagne SJ, Gilman AB, et al. Post-discharge services and psychiatric rehospitalization among children and youth. *Adm Policy Ment Health*. 2010;37(5):433–445
13. van Alphen NR, Stewart JG, Esposito EC, Pridgen B, Gold J, Auerbach RP. Predictors of rehospitalization for depressed adolescents admitted to acute psychiatric treatment. *J Clin Psychiatry*. 2017;78(5):592–598
14. Kim WJ; American Academy of Child and Adolescent Psychiatry Task Force on Workforce Needs. Child and adolescent psychiatry workforce: a critical shortage and national challenge. *Acad Psychiatry*. 2003;27(4):277–282
15. Hyde PS. *Report to Congress on the Nation's Substance Abuse and Mental Health Workforce Issues*. Rockville, MD: US Department of Health and Human Services, Substance Abuse and Mental Health Services; 2013. Available at: [www.cimh.org/sites/main/files/file-attachments/samhsa\\_bhwork\\_0.pdf](http://www.cimh.org/sites/main/files/file-attachments/samhsa_bhwork_0.pdf). Accessed November 16, 2015
16. Robiner WN. The mental health professions: workforce supply and demand, issues, and challenges. *Clin Psychol Rev*. 2006;26(5):600–625
17. Olsson M, Gameroff MJ, Marcus SC, Greenberg T, Shaffer D. Emergency treatment of young people following deliberate self-harm. *Arch Gen Psychiatry*. 2005;62(10):1122–1128
18. Bridge JA, Marcus SC, Olsson M. Outpatient care of young people after emergency treatment of deliberate self-harm. *J Am Acad Child Adolesc Psychiatry*. 2012;51(2):213–222.e1
19. Bardach NS, Coker TR, Zima BT, et al. Common and costly hospitalizations for pediatric mental health disorders. *Pediatrics*. 2014;133(4):602–609
20. Shaw RJ, Wamboldt M, Bursch B, Stuber M. Practice patterns in pediatric consultation-liaison psychiatry: a national survey. *Psychosomatics*. 2006;47(1):43–49
21. Bierenbaum ML, Katsikas S, Furr A, Carter BD. Factors associated with non-reimbursable activity on an inpatient pediatric consultation-liaison service. *J Clin Psychol Med Settings*. 2013;20(4):464–472
22. Green C, Hampton E, Ward MJ, Shao H, Bostwick S. The current and ideal state of mental health training: pediatric program director perspectives. *Acad Pediatr*. 2014;14(5):526–532
23. Freed GL, Dunham KM, Switalski KE, Jones MD Jr, McGuinness GA; Research Advisory Committee of the American Board of Pediatrics. Recently trained general pediatricians: perspectives on residency training and scope of practice. *Pediatrics*. 2009;123(suppl 1):S38–S43
24. Hampton E, Richardson JE, Bostwick S, Ward MJ, Green C. The current and ideal state of mental health training: pediatric resident perspectives. *Teach Learn Med*. 2015;27(2):147–154
25. Callahan ST, Fuchs DC, Shelton RC, et al. Identifying suicidal behavior among adolescents using administrative claims data. *Pharmacoepidemiol Drug Saf*. 2013;22(7):769–775
26. Feudtner C, Feinstein JA, Zhong W, Hall M, Dai D. Pediatric complex chronic conditions classification system version 2: updated for ICD-10 and complex medical technology dependence and transplantation. *BMC Pediatr*. 2014;14:199
27. Hagan JF, Shaw JS, Duncan PM, eds. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*. 4th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2017

28. Mojtabai R, Olfson M, Han B. National trends in the prevalence and treatment of depression in adolescents and young adults. *Pediatrics*. 2016;138(6):e20161878
29. Curtin SC, Warner M, Hedegaard H. *Increase in Suicide in the United States, 1999-2014. NCHS Data Brief, No 241*. Hyattsville, MD: National Center for Health Statistics; 2016. Available at: <https://www.cdc.gov/nchs/products/databriefs/db241.htm>. Accessed July 1, 2017
30. QuickStats: death rates for motor vehicle traffic injury,\* suicide,† and homicide§ among children and adolescents aged 10-14 years - United States, 1999-2014. *MMWR Morb Mortal Wkly Rep*. 2016;65(43):1203
31. Sheftall AH, Asti L, Horowitz LM, et al. Suicide in elementary school-aged children and early adolescents. *Pediatrics*. 2016;138(4):e20160436
32. Bridge JA, Asti L, Horowitz LM, et al. Suicide trends among elementary school-aged children in the United States from 1993 to 2012. *JAMA Pediatr*. 2015;169(7):673–677
33. Balis T, Postolache TT. Ethnic differences in adolescent suicide in the United States. *Int J Child Health Hum Dev*. 2008;1(3):281–296
34. Stanley IH, Horowitz LM, Bridge JA, Wharff EA, Pao M, Teach SJ. Bullying and suicide risk among pediatric emergency department patients. *Pediatr Emerg Care*. 2016;32(6):347–351
35. Holt MK, Vivolo-Kantor AM, Polanin JR, et al. Bullying and suicidal ideation and behaviors: a meta-analysis. *Pediatrics*. 2015;135(2). Available at: [www.pediatrics.org/cgi/content/full/135/2/e496](http://www.pediatrics.org/cgi/content/full/135/2/e496)
36. Lenhart A. *Teen, Social Media and Technology Overview*. Washington, DC: Pew Research Center; 2015
37. Barlett C, Coyne SM. A meta-analysis of sex differences in cyber-bullying behavior: the moderating role of age. *Aggress Behav*. 2014;40(5):474–488
38. Shaffer D, Gould MS, Fisher P, et al. Psychiatric diagnosis in child and adolescent suicide. *Arch Gen Psychiatry*. 1996;53(4):339–348
39. Biro FM, Greenspan LC, Galvez MP. Puberty in girls of the 21<sup>st</sup> century. *J Pediatr Adolesc Gynecol*. 2012;25(5):289–294
40. Lu CY, Zhang F, Lakoma MD, et al. Changes in antidepressant use by young people and suicidal behavior after FDA warnings and media coverage: quasi-experimental study. *BMJ*. 2014;348:g3596
41. Chang S-S, Stuckler D, Yip P, Gunnell D. Impact of 2008 global economic crisis on suicide: time trend study in 54 countries. *BMJ*. 2013;347:f5239
42. Gassman-Pines A, Ananat EO, Gibson-Davis CM. Effects of statewide job losses on adolescent suicide-related behaviors. *Am J Public Health*. 2014;104(10):1964–1970
43. Mojtabai R, Jorm AF. Trends in psychological distress, depressive episodes and mental health treatment-seeking in the United States: 2001-2012. *J Affect Disord*. 2015;174:556–561
44. Lueck C, Kearn L, Lam CN, Claudius I. Do emergency pediatric psychiatric visits for danger to self or others correspond to times of school attendance? *Am J Emerg Med*. 2015;33(5):682–684
45. Hansen B, Lang M. Back to school blues: seasonality of youth suicide and the academic calendar. *Econ Educ Rev*. 2011;30(5):850–861
46. Coimbra DG, Pereira E Silva AC, de Sousa-Rodrigues CF, et al. Do suicide attempts occur more frequently in the spring too? A systematic review and rhythmic analysis. *J Affect Disord*. 2016;196(196):125–137
47. Beauchamp GA, Ho ML, Shan Y. Variation in suicide occurrence by day and during major American holidays. *J Emerg Med*. 2014;46(6):776–781
48. Rosin H. The silicon valley suicides: why are so many kids with bright prospects killing themselves in Palo Alto? *Atlantic Monthly*. 2015;316:62–73
49. Kutner M. Teen suicide is contagious, and the problem may be worse than we thought. *Newsweek*, 28 Oct. 2016. <http://www.newsweek.com/2016/10/28/teen-suicide-contagious-colorado-springs-511365.html>. Accessed April 7, 2018.
50. Kristjánsdóttir J, Olsson GI, Sundelin C, Naessen T. Self-reported health in adolescent girls varies according to the season and its relation to medication and hormonal contraception—a descriptive study. *Eur J Contracept Reprod Health Care*. 2013;18(5):343–354
51. Ayers JW, Althouse BM, Allem J-P, Rosenquist JN, Ford DE. Seasonality in seeking mental health information on Google. *Am J Prev Med*. 2013;44(5):520–525
52. Shain B; Committee on Adolescence. Suicide and suicide attempts in adolescents. *Pediatrics*. 2016;138(1):e20161420
53. Detecting and treating suicide ideation in all settings. *Sentinel Event Alert*. 2016;(56):1–7
54. Costello EJ, He JP, Sampson NA, Kessler RC, Merikangas KR. Services for adolescents with psychiatric disorders: 12-month data from the National Comorbidity Survey-Adolescent. *Psychiatr Serv*. 2014;65(3):359–366
55. Olfson M, Blanco C, Wang S, Laje G, Correll CU. National trends in the mental health care of children, adolescents, and adults by office-based physicians. *JAMA Psychiatry*. 2014;71(1):81–90
56. Olfson M, Druss BG, Marcus SC. Trends in mental health care among children and adolescents. *N Engl J Med*. 2015;372(21):2029–2038
57. Peterson J, Freedenthal S, Sheldon C, Andersen R. Nonsuicidal self injury in adolescents. *Psychiatry (Edgmont)*. 2008;5(11):20–26
58. Mercado MC, Holland K, Leemis RW, Stone DM, Wang J. Trends in emergency department visits for nonfatal self-inflicted injuries among youth aged 10 to 24 years in the United States, 2001-2015. *JAMA*. 2017;318(19):1931–1933
59. Hawton K, Saunders KEA, O'Connor RC. Self-harm and suicide in adolescents. *Lancet*. 2012;379(9834):2373–2382
60. Nock MK, Joiner TE Jr, Gordon KH, Lloyd-Richardson E, Prinstein MJ. Non-suicidal self-injury among adolescents: diagnostic correlates and relation

to suicide attempts. *Psychiatry Res.* 2006;144(1):65–72

61. Brausch AM, Gutierrez PM. Differences in non-suicidal self-injury and suicide

attempts in adolescents. *J Youth Adolesc.* 2010;39(3):233–242

62. Owens PL, Fingar KR, Heslin KC, Mutter R, Booth CL. *Emergency Department*

*Visits Related to Suicidal Ideation, 2006-2013: Statistical Brief #220.* Rockville, MD: Agency for Healthcare Research and Quality; 2006