Center for Health Policy and Health Services Research Articles

11-23-2021

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Pauline Goger

Argero A. Zerr

V. Robin Weersing

John F. Dickerson

Phillip M. Crawford

See next page for additional authors

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Authors

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Health Service Utilization Among Children and Adolescents with Posttraumatic Stress Disorder: A Case-Control Study

Pauline Goger, MS,* Argero A. Zerr, PhD,† V. Robin Weersing, PhD,* John F. Dickerson, PhD,‡ Phillip M. Crawford, MS,‡ Stacy A. Sterling, DrPH, MSW,§ Beth Waitzfelder, PhD,‖ Yihe G. Daida, PhD,‖ Brian K. Ahmedani, PhD,¶ Robert B. Penfold, PhD,** Frances L. Lynch, PhD, MSPH‡

ABSTRACT: *Objective:* Trauma exposure is widely prevalent, with more than 60% of adolescents having experienced at least 1 traumatic event and a third of those at high risk to develop posttraumatic stress disorder (PTSD). Data are scarce and out of date on the services children and adolescents with PTSD receive, impeding efforts to improve care and outcomes. This study examines health service use for a large and diverse sample of children and adolescents with and without a diagnosis of PTSD. *Method:* Using a matched case-control study, we gathered information from 4 large health care systems participating in the Mental Health Research Network. Data from each site's electronic medical records on diagnoses, health care encounters, and demographics were analyzed. Nine hundred fifty-five 4- to 18-year-olds with a diagnosis of PTSD were identified and matched on a 1:5 ratio to 4770 controls. We compared cases with controls on frequency of service use in outpatient primary care, medical specialty care, acute care, and mental health care. We also assessed psychotropic medication use. *Results:* Children and adolescents diagnosed with PTSD used nearly all physical and mental health service categories at a higher rate than controls. However, one-third of children and adolescents did not receive even 1 outpatient mental health visit (36.86%) during the year-long sampling window. *Conclusion:* Our findings suggest that children and adolescents diagnosed with PTSD may have unmet mental health needs. They are high utilizers of health services overall, but lower utilizers of the sectors that may be most helpful in resolving their symptoms.

(J Dev Behav Pediatr 00:1–8, 2021) **Index terms:** PTSD, children and adolescents, health service utilization.

Approximately 25% to 30% of children are exposed to a potentially traumatic event,[1,2] with cumulative exposure exceeding 60% for adolescents.[3,4] The most common traumas in youth (i.e., children and adolescents younger than age 18) include witnessing violence, traffic accidents, natural disasters, and physical and sexual abuse.[3,5,6] Trauma exposure is linked to poor proximal outcomes during childhood, including emotion regulation difficulties, hypothalamus-pituitary-adrenal axis dysregulation, immune system dysfunction, substance abuse, suicide attempts, and development of posttraumatic stress disorder (PTSD),[3,7–10] and to distal outcomes of adult health risk behavior, chronic disease, and early mortality.[11] Furthermore, there is evidence suggesting that youths meeting diagnostic criteria for PTSD may be at especially high risk for these negative outcomes.[12,13]

Despite significant health impacts of trauma exposure and PTSD, screening for trauma within pediatric settings is only slowly becoming routine.[14] Little is known about the prevalence of PTSD in health care settings or the patterns or adequacy of care received by identified youths.[15] The existing research suggests that youth with traumatic stress symptoms may show elevated rates of utilization[16] across a variety of care settings (e.g., general practitioner, school, justice, and child welfare), including more frequent and longer-lasting hospitalizations.[17–22] Although these investigations are a useful foundation, they are limited in a variety of respects. First, data on service use have largely been reliant on parent or youth report. Few studies use medical records or claims data or ask more than a single question[16,24] about whether any services have been used during the study period—which was restricted to just the preceding 30 to 60 days for some studies.[18,20] A key exception is the work of Seng et al.,[13] which involved Medicaid data for youths with PTSD. However, these data were restricted to 1 state, are now more than 25 years old, and consist of an entirely female sample. Second, few previous studies used a control or comparison group. For example, studies reporting service utilization rates from the National Child

Traumatic Stress Network do not compare reported service rates with youth without trauma exposure. Third, the existing literature primarily comprises studies limited to adolescent participants,[16,21,22] and less is known about services for children with PTSD.

As a result, the field lacks a clear picture of the mental and physical health care service utilization patterns among children and adolescents with PTSD. These data are needed to serve as a base for outreach and quality improvement efforts for this high-risk condition. This study seeks to address this need by conducting a case-control study of service utilization in youth with PTSD among a large, insured population.

METHOD
Settings and Sources of Data

Data were drawn from a larger study on the health care service utilization of youths with anxiety diagnoses (see the study by Weersing et al.[23] for additional details). This parent study pulled data from 4 health care systems participating in the Mental Health Research Network: Kaiser Permanente Northwest based in Portland, OR; Henry Ford Health System based in Detroit, MI; Kaiser Permanente Northern California based in Oakland, CA; and Kaiser Permanente Hawaii based in Honolulu. These harmonized data included electronic health records from the health systems and insurance claims data for members of each health system. The Institutional Review Boards for each health system approved data use and research activities for this project.

Participants

The sample for our larger parent study was created from 2 years of patient data (year 1: January 1, 2013–December 31, 2013; year 2: January 1, 2014–December 31, 2014). The following inclusion criteria were used to select a sample of qualifying youths: (1) age 4.0 to 17.9 years in the analysis window, (2) at least 1 health contact in year 1, (3) at least 10 months of health plan enrollment in year 2, and (4) no long-term institutionalization in year 2 (>30 d). For the current project, youths were identified as cases if they had an *International Classification of Diseases-9* diagnostic code for posttraumatic stress disorder (PTSD) (309.81) in year 1. Youths without an anxiety or PTSD diagnosis in year 1 who received a diagnosis of anxiety or PTSD in year 2 were excluded from the sample. To create a comparison group, youth with PTSD were matched with a 1:5 ratio to control peers using 4 sociodemographic indices: age, sex (male/female), number of quarters of enrollment in year 1, and prescription drug coverage (yes/no; yes = coverage for at least the final quarter of year 1 and all covered months of year 2). Control youths did not meet criteria for PTSD or for any other anxiety diagnoses in the original parent study sample in either year 1 or year 2.

Measures of Health Care Utilization

Service use data were derived from department and provider specialty information along with procedure codes in year 2. Presence (yes/no), frequency (number of visits), and type of service use were assessed in out-patient primary care (pediatrics, family medicine, or internal medicine), medical specialty care (neurology, cardiology, or gastroenterology), acute care (emergency room or urgent care), and mental health care by setting (outpatient or inpatient) and by type of service (any psychotherapy, individual/family therapy, or group therapy). Psychotropic medication use (yes/no) was coded as present in year 2 if a pharmacy dispense was recorded for 1 or more classes of agent: beta blockers, benzodiazepines, monoamine oxidase inhibitors, tri-cyclic antidepressants, serotonin-norepinephrine reup-take inhibitors, selective serotonin reuptake inhibitors, other anxiolytics, other antidepressants, and other sleep aids (sedative or hypnotics). Medication management/brief counseling visits were coded as yes/no.

Control Variables

Demographic characteristics were derived from each site's virtual data warehouse and included sex (male/female), age as a continuous variable, insurance type (primarily commercial, any Medicaid, or others), and a composite variable for race/ethnicity (White non-Hispanic, African-American non-Hispanic, Asian non-Hispanic, Hispanic, Other non-Hispanic [Multiracial, Native American, Pacific Islander/Hawaiian, or Others], and unknown). Psychiatric control variables included comorbid diagnoses of depression, bipolar disorder, attention-deficit/hyperactivity disorder, disruptive behavior disorders, pervasive developmental disorders and autism spectrum disorders, and substance use disorder. Physical health control variables were also assessed, including asthma, allergy disorders and reactions, gastrointestinal disorders, and sleep disorders.

Statistical Analyses and Data Analytic Plan

Bivariate analyses were conducted to probe for significant differences between PTSD and control youths on nonmatched sociodemographic characteristics, psychiatric comorbidities, and physical health conditions. Significant variables identified through these analyses were included as covariates in all subsequent analyses. Conditional logistic regression models were used to estimate the association between the presence of a PTSD diagnosis and whether a service was accessed at all during the sampling window. Conditional negative binomial regression models were used to estimate the associations of PTSD status with number of visits for each type of service.

RESULTS
Participant Characteristics

Across sites, 955 youths diagnosed with posttraumatic stress disorder (PTSD) were identified as meeting qualifying criteria and matched on a 1:5 ratio to 4770 control youths who were not diagnosed with PTSD or any

anxiety disorders. The final analytic sample consisted of 5725 youths from 4 sites. The sample consisted mostly of female (69.21%) adolescents (M = 14.23, SD = 2.80) and was diverse, with less than half (42.62%) identifying as White non-Hispanic and 31.52% identifying as Hispanic. Most of the families had commercial insurance (70.58%).

Demographic and Clinical Differences

The matching algorithm was successful in that youths diagnosed with PTSD and control youths showed no significant differences in age and sex ($p > 0.98$). Compared with control youths, those diagnosed with PTSD were more likely to be White non-Hispanic, Black, or Hispanic, whereas nondiagnosed control youths were more likely to be Asian. Furthermore, youths diagnosed with PTSD were more likely to have Medicaid than control youths (who were more likely to have commercial insurance) and were more likely to have been diagnosed with both comorbid mental health diagnoses (depression, bipolar disorders, oppositional defiant disorder/conduct disorder, attention-deficit/hyperactivity disorder, substance use, and autism spectrum disorders/pervasive developmental disorders) and comorbid physical health diagnoses (allergies, asthma, gastrointestinal diseases, and sleep disorders and problems; Table 1). Subsequent analyses included all of these significant differences as control variables when comparing youths diagnosed with PTSD and control youths.

Overall Health Care Utilization

Service use

Youths diagnosed with PTSD used nearly all service categories at significantly higher rates than control youths, with the exception of specialist care settings—which were used at relatively low rates overall (approximately 1%–3%)—and urgent care, which had comparable utilization rates (9.32% vs 6.96%, respectively, $p = 0.32$; Table 2). Youths diagnosed with PTSD were about one and a half times as likely as control youths to receive services from internal medicine ($p = 0.004$), nearly 3 times as likely to visit the emergency department ($p < 0.001$), and more than 5 times as likely to receive psychotherapy in any setting ($p = 0.001$). They were also 5 times as likely to receive mental health services in high-cost inpatient settings ($p = 0.026$). Youths diagnosed with PTSD also had significantly higher rates of receiving a pharmacy dispense of a targeted psychotropic medication (50.79% vs 6.54%) and engaging in medication management/brief counseling sessions (6.70% vs 0.44%). Importantly, although youths diagnosed with PTSD did exhibit a significantly higher utilization of mental health care than control youths, approximately a third did not receive any outpatient mental health care (36.86%) and one half did not receive a pharmacy dispense (49.21%). Of note, nearly a third (28.17%) of youth with PTSD diagnoses did not seem to receive mental health care of any kind during the sample window, with no recorded use of outpatient, inpatient,

psychotherapy (any setting), or psychotropic medication use (Table 2).

Number of Visits

Youths diagnosed with PTSD had a greater number of internal medicine visits (M = 3.58 vs M = 0.77) but were otherwise comparable with control youths across outpatient medical and specialist care settings (Table 3). The largest differences seen between these 2 groups were for number of psychotherapy visits and inpatient mental health admissions. Youths diagnosed with PTSD had an average of 6.23 psychotherapy visits, whereas control youths had 0.29, $p < 0.001$. For inpatient mental health, youths diagnosed with PTSD had 0.19 admissions, on average, whereas control youths had a mean of 0.00 admissions, $p < 0.001$. Outpatient mental health was also significantly different among groups, with youths diagnosed with PTSD having an average of 6.65 visits and control youths 0.31 visits. Among the subset of youths who used these services at least once, these differences remained statistically significant for psychotherapy and outpatient visits, but not inpatient services. Among youths who accessed services at least once, those diagnosed with PTSD had an average of 12.25 psychotherapy visits, 10.53 outpatient mental health visits, and 1.84 inpatient mental health admissions, whereas control youths had an average of 5.55 psychotherapy visits ($p < 0.0001$), 4.35 outpatient visits ($p < 0.001$), and 1.27 inpatient admissions ($p = 0.186$).

Medication Use

Overall, youths diagnosed with PTSD had more psychotropic medication use across all classes than control youths (most $p < 0.001$, Table 4). The largest differences were seen in second generation antipsychotics (16.96% vs 0.34%) and selective serotonin reuptake inhibitors (30.79% vs 1.01%). We further examined the proportion of youth who had a psychotropic medication dispensed during the sample year but did not have any recorded use of mental health services (inpatient, outpatient, or psychotherapy in any setting). These youth could have received prescriptions from nonmental health settings (e.g., pediatrics) or have been refilling prescriptions without an office visit. Rates of medication use without concomitant mental health visits were low overall (7.43%).

DISCUSSION
Summary of Findings

Children and adolescents are exposed to potentially traumatic events at alarmingly high rates, with one-third of these youth developing symptoms of posttraumatic stress disorder (PTSD) and 1% to 6% receiving a formal diagnosis.[3,10,25] To better understand the health service utilization of youth diagnosed with PTSD, we examined a large and diverse sample across multiple health care settings and types of services over a 2-year period. The findings reveal that youth diagnosed with PTSD use health services at higher rates than controls in most cases. However, they may not be receiving sufficient levels of mental health care.

Table 1. Participant Sociodemographic and Clinical Characteristics

	PTSD		Control		
	n	**%**	**n**	**%**	**p**
Total patients	955	100.00	4770	100.00	
Sex					
Male	294	30.79	1470	30.82	0.9843
Female	661	69.21	3300	69.18	
Age					
4–7 yr	24	2.51	115	2.41	0.9950
8–12 yr	214	22.41	1070	22.43	
13–17 yr	717	75.08	3585	75.16	
Race/ethnicity					<0.0001
White NH	407	42.62	1853	38.85	0.0257
Black/African-American NH	117	12.25	398	8.34	0.0002
Asian NH	30	3.14	748	15.68	<0.0001
Hispanic, all races	301	31.52	1296	27.17	0.0053
Unknown/missing	31	3.25	259	5.43	0.0004
Others (analytic category)	69	7.23	216	4.53	0.0059
Multiracial	43	4.50	127	2.66	
Native Hawaiian/Pacific Islander	20	2.09	62	1.30	
Native American	6	0.63	23	0.48	
Insurance type					<0.0001
Commercial	674	70.58	3789	79.43	<0.0001
Any Medicaid	203	21.26	690	14.47	<0.0001
Others	78	8.17	291	6.10	0.0167
Other comorbid mental health diagnoses					
Depression	364	38.12	123	2.58	<0.0001
Bipolar disorders	158	16.54	22	0.46	<0.0001
ODD/CD	81	8.48	22	0.46	<0.0001
ADHD	211	22.09	188	3.94	<0.0001
Substance use	75	7.85	40	0.84	<0.0001
ASD/PDD	21	2.20	26	0.55	<0.0001
Comorbid physical health diagnoses					
Allergy disorder and reactions	167	17.49	635	13.31	0.0007
Asthma	205	21.47	536	11.24	<0.0001
Gastrointestinal diseases	39	4.08	92	1.93	<0.0001
Sleep disorders and problems	78	8.17	48	1.01	<0.0001

ADHD, attention-deficit/hyperactivity disorder; ASD, autism spectrum disorder; NH, non-Hispanic; ODD/CD, oppositional defiant disorder/conduct disorder; PDD, pervasive developmental disorder; PTSD, posttraumatic stress disorder.

As compared with controls, youth with a diagnosis of PTSD were significantly more likely to receive services from pediatrics, family medicine, or internal medicine settings; psychotherapy in any setting; and outpatient mental health settings. Youths were also more likely to receive services from the high-cost emergency department and inpatient mental health settings. Youth with a diagnosis of PTSD were also much more likely to receive a pharmacy dispense and engage in medication management encounters than control youth. Despite the fact that youth diagnosed with PTSD used mental health services at significantly higher rates than control youth, only approximately two-thirds (63.14%) received outpatient mental health services, whereas half (50.79%) received medications. Per practice parameters[26] for youth PTSD, psychotropic medications such as selective serotonin reuptake inhibitors can be an important adjunct to psychotherapy, especially for youth with comorbid conditions or more severe symptoms, and thus, this rate of medication dispense may indicate unmet needs. Most critically, almost one-third (28.17%) of youth diagnosed with PTSD did not receive any mental

Table 2. Service Utilization for PTSD and Control Youth

	PTSD		Control			
	n	% with Use	n	% with Use	OR	p
Outpatient settings						
Pediatrics	762	79.79	3592	75.30	0.77	0.018
Family medicine	144	15.08	531	11.13	1.33	0.039
Internal medicine	488	51.10	1538	32.24	1.31	0.004
Specialist care, any setting						
Neurology	30	3.14	54	1.13	1.03	0.947
Cardiology	34	3.56	90	1.89	1.36	0.247
Gastroenterology	17	1.78	33	0.69	1.87	0.364
Acute care settings						
Urgent care	89	9.32	332	6.96	1.18	0.317
Emergency department	366	38.32	662	13.88	1.87	0.000
Mental health care by setting						
Outpatient mental health	603	63.14	336	7.04	9.09	0.000
Inpatient mental health	101	10.58	11	0.23	1685.02	0.026
Psychotherapy, any setting	486	50.89	252	5.28	7.17	0.000
Individual/family	433	45.34	226	4.74	6.62	0.000
Group therapy	223	23.35	91	1.91	5.22	0.000
Psychotropic use, any setting						
Pharmacy dispense	485	50.79	312	6.54	6.56	0.000
Medication management/brief counseling	64	6.70	21	0.44	4.84	0.000
Mental health composite variables						
Psychotropic medications only	71	7.43	192	4.03	2.20	<0.001
No mental health services	269	28.17	4236	88.81	0.10	<0.001

PTSD, posttraumatic stress disorder.

health services at all during the study period, whereas 7.43% of youth filled prescriptions for psychotropic mediations without using any other mental health services. This is problematic for PTSD symptoms and impairment and for other apparently physical symptoms (e.g., stomach aches)[27] that may be anxiety-related. Not only does this affect youth who continue to experience symptoms without long-term relief, but it may also have negative consequences for health systems by contributing to the use of ineffective and expensive services (e.g., increased emergency department visits).

Among those youth with PTSD who did receive outpatient mental health services, the average number of outpatient sessions was 10.53. Although the session content in this sample is unknown, it is important to note that trauma-focused cognitive behavioral therapy (TF-CBT, an evidence-based approach to treating PTSD in youth) is typically of similar length (12–20 sessions).[28] Therefore, if not already implemented, it may be possible to scale up the currently offered sessions for frequency, length, and intensity to offer efficacious treatments, such as TF-CBT, more easily than if the current session average was significantly lower.

These findings are broadly consistent with existing literature, which generally indicates that youth with

trauma exposure or PTSD tend to be high users of mental health services.[17,20,22] However, this study's results are unique in several ways. First, we examined a broad range of health and mental health services in detail. Second, this study included a large sample of both children and adolescents clinically diagnosed with PTSD in large health systems. Third, we included a comparison group of youth not diagnosed with this disorder. Fourth, we followed youth for 2 years to identify youth with current PTSD diagnoses. Finally, in contrast to most previous studies that used self-reports, this study examined electronic health records, allowing us to accurately assess service use in greater detail.

Limitations

These results should be considered in light of the limitations of this study. This study relied on clinical diagnosis of PTSD instead of standardized research assessments and may therefore be subject to either overdiagnosis or underdiagnosis because types of clinicians conferring diagnoses and assessments used may have varied. Prior research and available data suggest that underdiagnosis is more likely. PTSD is often comorbid with and potentially overshadowed by other issues (e.g., externalizing problems), children might not

Table 3. Service Visits for PTSD and Control Youth

| | PTSD | | | | | Control | | | | | | |
| | | Visits | | Visits Among Users | | | Visits | | Visits Among Users | | | |
	n	M	SD	M	SD	n	M	SD	M	SD	IRR	p
Outpatient settings												
Pediatrics	762	2.57	2.83	3.22	2.82	3592	1.75	1.88	2.32	1.83	1.08	0.068
Family medicine	144	0.36	1.31	2.37	2.59	531	0.17	0.60	1.53	1.06	1.21	0.150
Internal medicine	488	3.58	8.39	7.00	10.68	1538	0.77	2.48	2.39	3.91	1.79	0.000
Specialist care, any setting												
Neurology	30	0.07	0.60	2.20	2.64	54	0.02	0.25	1.98	1.31	1.35	0.433
Cardiology	34	0.06	0.35	1.62	0.99	90	0.04	0.36	1.91	1.82	1.47	0.202
Gastroenterology	17	0.04	0.31	2.06	1.20	33	0.02	0.25	2.36	1.93	0.89	0.825
Acute care settings												
Urgent care	89	0.17	0.73	1.88	1.57	332	0.10	0.41	1.39	0.79	1.44	0.016
Emergency department	366	0.79	1.47	2.07	1.73	662	0.18	0.54	1.29	0.81	1.79	0.000
Mental health care by setting												
Outpatient mental health	603	6.65	11.67	10.53	13.23	336	0.31	1.91	4.35	5.86	7.88	0.000
Inpatient mental health	101	0.19	0.85	1.84	1.97	11	0.00	0.06	1.27	0.47	17.89	0.000
Psychotherapy, any setting	486	6.23	13.32	12.25	16.59	252	0.29	1.90	5.55	6.29	9.85	0.000
Individual/family	433	3.81	8.06	8.40	10.23	226	0.20	1.26	4.13	4.17	9.79	0.000
Group therapy	223	2.27	7.18	9.70	12.20	91	0.09	1.03	4.76	5.82	9.90	0.000
Psychotropic use, any setting												
Medication management/brief counseling	485	0.16	0.98	2.38	3.05	312	0.01	0.11	1.48	0.68	7.35	0.000

IRR, incidence rate ratio; PTSD, posttraumatic stress disorder.

meet all criteria at the time of evaluation (e.g., symptoms for less than 1 mo), or the physician may not screen for traumatic events in the youth's life and be unaware of both trauma exposure and PTSD symptoms. Miele and O'Brien,[29] for example, found that rates of PTSD diagnosis increased from 5.4% to 44.6% of at-risk outpatient youth when a trauma-focused interview was used. In this study,

0.18% of the qualifying sample (i.e., 955 of 524,475 youth) was found to have a diagnosis of PTSD in their medical record. Given conservative estimates of a 1% PTSD prevalence in general population studies,[3,10,25] this suggests that, on average, less than every fifth child with PTSD is being identified in the current sample. Rates of PTSD in this sample were especially low for Asian youths, indicating

Table 4. Medication Use for PTSD and Control Youth

| | PTSD | | Control | | | |
	n	% with Use	n	% with Use	OR	p
Antidepressant SSRI	294	30.79	48	1.01	21.28	0.000
Antidepressant SNRI	15	1.57	0	0.00	NA	NA
Antidepressant other	120	12.57	26	0.55	8.55	0.000
Antianxiety other	54	5.65	40	0.84	2.83	0.002
Anticonvulsants	68	7.12	26	0.55	5.23	0.001
Antipsychotic 1st gen	NA	NA	NA	NA	NA	NA
Antipsychotic 2nd gen	162	16.96	16	0.34	30.14	0.000
Lithium	NA	NA	NA	NA	NA	NA
Sleep: benzodiazepine	35	3.66	26	0.55	3.84	0.003
Sleep: nonbenzodiazepine	NA	NA	NA	NA	NA	NA
Stimulants	149	15.60	165	3.46	3.23	0.008
ADHD: other medications	93	9.74	26	0.55	15.39	0.000

ADHD, attention-deficit/hyperactivity disorder; NA, not applicable; OR, odds ratio; PTSD, posttraumatic stress disorder; SNRI, serotonin-norepinephrine reuptake inhibitors; SSRI, selective serotonin reuptake inhibitors.

underdiagnosis may vary by race/ethnicity. Similarly, younger children are often underdiagnosed, especially if evaluated for PTSD by criteria that are not developmentally sensitive,[30] indicating that the proportion of younger children in this sample may be too low as well. In addition, the findings from this study may not generalize to other samples of youth with PTSD, especially youth with limited contact with the health care system. This might include refugee and asylum-seeking youth or youth experiencing inconsistent housing or caregiving situations, which might then extend to inconsistent contact with the health care system. Homeless and foster care youth and victims of human trafficking might be especially vulnerable, and the unique circumstances surrounding their traumatic experiences may lead to differential service utilization patterns if or when they do access care. Youths with a lower socioeconomic status (SES) background might also display differential trauma exposure and service utilization; future work might disentangle SES in a more comprehensive way because our study was only able to use Medicaid as a proxy. Finally, it is possible that participants in this study used services outside of the health care system. For example, they might have used resources at school, in the justice system, or at other social services agencies.

Directions for Future Research

This study was, to the best of our knowledge, the first using electronic health record data to examine the service utilization patterns of youth diagnosed with PTSD. Our findings provide valuable data on the pattern and adequacy of services for youth with PTSD, including the finding that youths may be overutilizing emergency services and underutilizing outpatient mental health. However, research on this health-system scale does not allow insight into why such few youths with PTSD are identified and why those who are identified might not be receiving the evidence-based treatment that would be indicated for their condition. Future research should address both the lack of identification of youth with PTSD and the quality and content of care youth diagnosed with PTSD are receiving to better evaluate how services could address their needs in a more efficient and effective manner.

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