Clinical Profiles and Health Services Patterns of Medicaid-Enrolled Youths Who Died by Suicide

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+ Supplemental content

IMPORTANCE Youth suicide is a major public health problem, and health care settings play a critical role in suicide prevention efforts, but limited data are available to date on health and mental health service use patterns before suicide.

OBJECTIVE To compare the clinical profiles and patterns of use of health and mental health care services among children and adolescents who died by suicide and a matched living control group.

DESIGN, SETTING, AND PARTICIPANTS This population-based case-control study used Medicaid data from 16 states merged with mortality data. Suicide cases (n = 910) included all youths aged 10 to 18 years who died by suicide from January 1, 2009, to December 31, 2013. Controls (n = 6346) were matched to suicide cases on sex, race, ethnicity, Medicaid eligibility category, state, and age. Data were analyzed from July 18 to November 19, 2019.

EXPOSURES Use of health and mental health care services.

MAIN OUTCOMES AND MEASURES Health and behavioral health care visits in the 6-month period before the index date (date of suicide). Associations among visits, clinical characteristics, and suicide were examined using logistic regression.

RESULTS The study population of 7256 Medicaid-enrolled youths included 5292 males (72.9%) with a mean (SD) age of 15.7 (2.0) years at the index date; 3619 (49.9%) were non-Hispanic white. Three hundred seventy-six suicide decedents (41.3%) had a mental health diagnosis in the 6 months before death compared with 1111 controls (17.5%; $P < .001$). A greater proportion of suicide decedents than controls used services before the index date (in 6 months, 687 suicide decedents [75.5%] vs 3669 controls [57.8%]; odds ratio [OR], 2.39 [95% CI, 2.02-2.82]). Suicide risk was highest among youths with epilepsy (OR, 4.89; 95% CI, 2.81-8.48; $P < .001$), depression (OR, 3.19; 95% CI, 2.49-4.09; $P < .001$), schizophrenia (OR, 3.18; 95% CI, 2.00-5.06; $P < .001$), substance use disorder (OR, 2.65; 95% CI, 1.67-4.20; $P < .001$), and bipolar disorder (OR, 2.09; 95% CI, 1.58-2.76; $P < .001$). More mental health visits within the 30 days before the index date were associated with decreased odds of suicide (OR, 0.78; 95% CI, 0.65-0.92; $P = .005$).

CONCLUSIONS AND RELEVANCE This study found that among youths aged 10 to 18 years who were enrolled in Medicaid, clinical characteristics and patterns of use of health care services among suicide decedents were distinct from those of nonsuicide controls. Implementation of suicide screening protocols for youths enrolled in Medicaid, targeted based on the frequency of visits, psychiatric diagnoses, and epilepsy, may have the potential to decrease suicide rates.

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S uicide among young people is a major public health prob-
lem. In the United States, the suicide rate among people
aged 10 to 24 years has increased by 50% since 1999.[1]
Suicide is currently the second leading cause of death in this
age group, accounting for 6769 deaths or 10.57 deaths per
100 000 population in 2017.[1] Access to health and mental
health care services is regarded as a central suicide preven-
tion strategy,[2] and a specific goal of the US Surgeon General
and of the National Action Alliance for Suicide Prevention is
to identify and treat persons at risk for suicide by promoting
access to general medical and mental health services.[3] Al-
though the health care system has been identified as an opti-
mal location for suicide prevention, limited data are available
to date on the patterns of use of health and mental health ser-
vices before suicide for children and adolescents. Most stud-
ies have focused on adults, are descriptive in nature, and lack
a control group, which limits conclusions about how ob-
served patterns of contact among individuals who died due to
suicide compare with those among nonsuicide control
individuals.[4-7] To enhance suicide prevention within health
care settings, it is necessary to better understand the charac-
teristics and patterns of service use for youths who died by sui-
cide.

The primary aim of this study is to compare the clinical
profiles and patterns of use of health and mental health ser-
vices among children and adolescents who died by suicide
(suicide cases) and a matched living control group during a
6-month period. Specific objectives include (1) comparison
of the health and mental health characteristics of suicide
decedents and matched living controls; (2) examination of
the prevalence and frequency of health care visits across a
range of health care settings among suicide decedents in the
1 and 6 months preceding death compared with controls;
(3) identification of the setting of the final visit before sui-
cide; and (4) examination of the association among health
care visits, clinical characteristics, and suicide. Based on
prior research,[8-10] we hypothesized that youths who die by
suicide are more likely to visit health care settings com-
pared with controls, and that youths with depressive, bipo-
lar, schizophrenia, conduct, and substance use disorders are
at increased risk for suicide.

Methods

Study Design

To achieve the study objectives, we implemented a retrospec-
tive matched case-control design. Suicide cases included all
children and adolescents aged 10 to 18 years who died by sui-
cide from January 1, 2009, to December 31, 2013, and who were
continuously enrolled in Medicaid for at least 6 months be-
fore death in California, Florida, Georgia, Illinois, Indiana, Mas-
sachusetts, Michigan, Minnesota, New York, North Carolina,
Ohio, Oregon, Texas, Virginia, Washington, and Wisconsin.
These states include the 10 most populous states in the United
States, span all regions of the country, and account for two-
thirds (65%) of the total child and adolescent population cov-
ered by Medicaid. Death certificate data obtained from each

Key Points

Question What are the clinical profiles and mental health service
patterns of children and adolescents who died by suicide, and how
do they differ from those of the general population?

Findings This population-based case-control study found that
suicide risk was highest among youths with epilepsy, depression,
schizophrenia, substance use disorder, and bipolar disorder.
Increased mental health visits within the 30 days before the index
date were associated with decreased odds of suicide.

Meaning These findings suggest that implementation of suicide
screening protocols for youths enrolled in Medicaid, targeted
based on frequency of visits, psychiatric diagnoses, and epilepsy,
has the potential to decrease suicide rates.

state's Department of Vital Statistics were used to identify
deaths due to suicide during the study period, based on *Inter-
national Statistical Classification of Diseases and Related Health
Problems, Tenth Revision*, codes X60 to X84, Y87.0, and *U03.
Age at death, sex, and cause of death were obtained directly
from the death certificates. Death certificate records were
merged with Medicaid Analytic eXtract (MAX) records based
on social security numbers, date of birth, and sex. For each
identified suicide case, as many as 10 controls were selected
to ensure adequate statistical power and matched on sex, race
as classified by Medicaid (white, black, or other), ethnicity (His-
panic or not), Medicaid eligibility category (income based, dis-
abled, or foster care), state of residence, and age (date of birth
±1 year) (eTable in the Supplement). Selected controls were en-
rolled the same year as the last year of enrollment for the
matched suicide case, were continuously enrolled for 6 months
before the date of suicide of the matched suicide case (for con-
trols, this date is the index date), and were alive on the date of
suicide of the matched case. All procedures were approved by
the institutional review board of The Ohio State University,
which waived the need for informed consent for the use of dei-
dentified data. This study followed the Strengthening the Re-
porting of Observational Studies in Epidemiology (STROBE)
reporting guideline.

Measures

Use of Services
Information was abstracted on all outpatient, inpatient, and
emergency department visits in the 6 months before death by
suicide or the index date. For analyses, treatment visits were
categorized as mental health and primary care health visits.
Mental health visits were defined as any visits with a primary
mental health diagnosis (*International Classification of Dis-
eases, Ninth Revision, Clinical Modification* [*ICD-9-CM*], codes
290-319) or mental health procedure code (eg, diagnostic in-
terview, pharmacological management, psychotherapy, case
management, or crisis intervention) by a specialist (eg, psy-
chiatrist or psychologist) or nonspecialist clinician (eg, pri-
mary care physician). General health visits were any physical
health–related visits to a primary care clinician, generalist, or
medical specialist.

Table 1. Clinical Characteristics of Suicide Cases and Matched Controls

Characteristic	Participant group[a]		P value
	Suicide cases (n = 910)	Controls (n = 6346)	
Any mental disorder	376 (41.3)	1111 (17.5)	<.001
No. of mental disorders, mean (SD)	0.76 (1.15)	0.27 (0.69)	<.001
Type of mental disorder			
ADHD	112 (12.3)	497 (7.8)	<.001
Conduct[b]	89 (9.8)	290 (4.6)	<.001
Depression	162 (17.8)	262 (4.1)	<.001
Bipolar and other mood disorders	127 (14.0)	249 (3.9)	<.001
Anxiety	81 (8.9)	216 (3.4)	<.001
Schizophrenia or psychosis	55 (6.0)	47 (0.7)	<.001
Adjustment	56 (6.2)	171 (2.7)	<.001
Other mental health conditions[c]	70 (7.7)	175 (2.8)	<.001
Any substance use disorder	102 (11.2)	174 (2.7)	<.001
Any chronic general medical condition	114 (12.5)	490 (7.7)	<.001
Asthma	51 (5.6)	226 (3.6)	.003
Cancer	11 (1.2)	82 (1.3)	.83
Congenital anomaly	7 (0.8)	72 (1.1)	.32
Seizure disorder	26 (2.9)	44 (0.7)	<.001
Diabetes	9 (1.0)	38 (0.6)	.17
Cerebral palsy	3 (0.3)	44 (0.7)	.20
Co-occurring mental disorder and general medical condition	61 (6.7)	146 (2.3)	<.001

Abbreviation: ADHD, attention-deficit/hyperactivity disorder.

[a] Unless otherwise indicated, data are expressed as number (percentage) of participants.

[b] Includes oppositional defiant disorder.

[c] Includes all mental health disorders coded as *International Classification of Diseases, Ninth Revision, Clinical Modification,* diagnosis codes 290 to 319 not otherwise categorized above.

Clinical Characteristics

Clinical characteristics include psychiatric diagnoses and chronic medical conditions. Psychiatric diagnoses were grouped into the following categories based on *ICD-9-CM* codes: no psychiatric diagnosis, attention-deficit/ hyperactivity disorder (code 314), conduct disorders (codes 312.00-312.9 and 313.81), depression (codes 296.2, 296.3, 300.4, and 311), bipolar disorder and other mood disorders (codes 296.00-296.1, 296.4-296.9, 301.13, 313.89, and 313.9), anxiety disorders (codes 300.00-300.09, 300.20-300.3, 309.21, and 309.81), schizophrenia/psychosis (codes 295, 297, and 298), adjustment disorders (codes 308 and 309), substance use disorder (codes 291, 292, and 303-305), and other mental health disorder (codes 290-319 except as noted above). The following chronic medical conditions were examined: diabetes (codes 250-250.91), seizure disorders (codes 345-345.91), cerebral palsy (codes 342-343.9), asthma (codes 493-493.91), cancer (codes 140-239.9), and congenital anomalies (codes 740-744 and 747.5-759).

Statistical Analysis

Data were analyzed from July 18 to November 19, 2019. Clinical characteristics and the prevalence of health care visits between suicide cases and matched controls were compared using conditional logistic regression that controlled for matching between the suicide and control groups. Frequency of health care visits was examined among those who had any visit within the 1- and 6-month periods before death or the index date. We used χ^2 tests to examine differences across counts of visits by visit type. All individuals who had a health care visit within the 6 months before death or index date were grouped based on the location and type of their last visit (eg, outpatient mental health, inpatient physical health, etc). Differences in location and type of last visit between suicide decedents and controls were examined using logistic regression. Associations among health care visits, clinical characteristics, and suicide were examined using logistic regression. All analyses were conducted using SAS, version 9.4 (SAS Institute Inc), with significance set at 2-sided $P < .05$.

Results

The final data set included 7256 Medicaid-enrolled youth (910 suicide decedents and 6346 controls). Overall, 5292 (72.9%) of the sample were male and 1964 (27.1%) were female, 3619 (49.9%) were non-Hispanic white, and the mean (SD) age was 15.7 (2.0) years at index date. Less than half of Medicaid-enrolled suicide decedents had a recorded mental health diagnosis (376 [41.3%]), which was a higher prevalence compared with controls (1111 [17.5%]; $P < .001$), and every specific psychiatric diagnosis assessed was more common among suicide cases than controls (**Table 1**). The most prevalent recorded psychiatric diagnoses among cases were depression (162 [17.8%]), bipolar disorder (127 [14.0%]), and ADHD (112 [12.3%]), and substance use disorders were more prevalent among suicide cases than controls (102 [11.2%] vs 174 [2.7%]; $P < .001$). Suicide cases were also more likely to have a chronic health condition than controls (114 [12.5%] vs 490 [7.7%]; $P < .001$) and were twice as likely to have co-occurring mental and chronic physical health disorders (61 [6.7%] vs 146 [2.3%]; $P < .001$). Epilepsy (26 [2.9%] vs 44 [0.7%]; $P < .001$) and

Table 2. Prevalence of Health Care Visits Among Suicide Cases and Matched Controls

Health care visit type	1 mo Before death			6 mo Before death		
	No. (%) of participants			No. (%) of participants		
	Suicide cases (n = 910)	Controls (n = 6346)	OR[a] (95% CI)	Suicide cases (n = 910)	Controls (n = 6346)	OR[a] (95% CI)
Any MH or PH	408 (44.8)	1539 (24.3)	2.87 (2.47-3.34)	687 (75.5)	3669 (57.8)	2.39 (2.02-2.82)
Any MH	204 (22.4)	641 (10.1)	3.21 (2.65-3.89)	367 (40.3)	1196 (18.8)	3.74 (3.18-4.40)
Emergency MH	22 (2.4)	15 (0.2)	9.81 (5.03-19.13)	63 (6.9)	70 (1.1)	7.51 (5.21-10.83)
Inpatient MH	8 (0.9)	3 (0.1)	19.27 (5.07-73.28)	34 (3.7)	25 (0.4)	9.63 (5.71-16.23)
Outpatient MH	194 (21.3)	632 (10.0)	3.04 (2.50-3.69)	344 (37.8)	1174 (18.5)	3.37 (2.86-3.96)
Any PH	292 (32.1)	1089 (17.2)	2.38 (2.03-2.79)	603 (66.3)	3301 (52.0)	1.85 (1.59-2.16)
Emergency PH	148 (16.3)	214 (3.4)	5.50 (4.36-6.94)	296 (32.5)	909 (14.3)	2.91 (2.48-3.41)
Inpatient PH	24 (2.6)	14 (0.2)	12.48 (6.29-24.78)	39 (4.3)	66 (1.0)	4.46 (2.93-6.80)
Outpatient PH	188 (20.7)	952 (15.0)	1.54 (1.29-1.85)	502 (55.2)	3007 (47.4)	1.38 (1.19-1.59)
No treatment	502 (55.2)	4807 (75.7)	0.35 (0.30-0.41)	223 (24.5)	2677 (42.2)	0.42 (0.35-0.49)

Abbreviations: MH, mental health; OR, odds ratio; PH, physical health.

[a] P < .001 for all comparisons. Conditional logistic regression based on matched pairs was used for analysis.

asthma (51 [5.6%] vs 226 [3.6%]; P = .003) were more prevalent among suicide cases than controls.

Prevalence of Health Care Contact Before Death

Three-quarters of suicide decedents (687 [75.5%]) had contact with a health or mental health service clinician in the 6 months before death, compared with 3669 controls (57.8%; odds ratio [OR], 2.39; 95% CI, 2.02-2.92; P < .001) (Table 2). Suicide decedents were also more likely to receive health or mental health services in the 1 month before death compared with controls (408 [44.8%] vs 1539 [24.3%]; OR, 2.87 [95% CI, 2.47-3.34]; P < .001), and 204 of 910 (22.4%) of suicide cases made a specialty mental health visit in the month before death by suicide. The general pattern of contacts between the groups was similar at 6 months and 1 month before death or index date, with physical health contacts being more prevalent overall than mental health contacts and a higher prevalence of decedents having a physical health or mental health service contact for every comparison.

Suicide decedents were more likely than controls to present for health and mental health services across all levels of care in the 1 and 6 months before death (Table 2). Differences between suicide cases and controls were particularly prominent in the inpatient and emergency department settings for physical health and mental health presentations in the 1 and 6 months before death or index date. Outpatient contacts were nevertheless the most prevalent types of visit during the 1 and 6 months before suicide or index date for suicide decedents and controls. Among suicide cases, ambulatory mental health visits were made by 194 decedents (21.3%), and physical health visits were made by 188 decedents (20.7%) at 1 month; at 6 months, these proportions were 344 (37.8%) and 502 (55.2%), respectively.

Frequency of Heath Care Contacts Before Death

Table 3 shows the frequency of health care visits among those who made any visit in the 1- and 6-month periods before death or index date. Suicide cases had a greater number of visits than

controls at 1 month (≥4 visits, 100 of 408 [24.5%] vs 281 of 1539 [18.3%]) and 6 months (≥4 visits, 351 of 687 [51.1%] vs 1393 of 3669 [38.0%]) before death. Proportionately more of the suicide cases made more visits for mental health care than controls did; in the 1 month before death, 129 of 408 cases (31.6%) had at least 2 mental health visits, whereas 380 of 1539 controls (24.7%) had at least 2 mental health visits in the index month. The frequency of physical health visits did not differ between cases and controls in the 1- or the 6-month periods.

Setting of Final Health Care Visit

Outpatient visits were the most common last visit type among suicide cases and controls (Table 4). Two hundred eighty-nine of 687 suicide cases (42.1%) and 2403 of 3669 controls (65.5%) had an outpatient physical health visit as their last visit, whereas 230 suicide cases (33.5%) and 827 controls (22.5%) had an outpatient mental health visit as their last visit, and 145 suicide cases (21.1%) and 419 controls (11.4%) had an emergency department visit as their last visit. Among those whose last visit was in the emergency department, suicide cases had a higher odds of mental (OR, 4.64; 95% CI, 2.14-10.08, P < .001) and physical (OR, 1.94; 95% CI, 1.56-2.40; P < .001) health visits, compared with controls. Suicide cases also had higher odds of the last visit being a physical health inpatient visit (OR, 7.31, 95% CI, 3.72-14.34; P < .001) or mental health outpatient visit (OR, 1.73; 95% CI, 1.45-2.06; P < .001) compared with controls. Suicide cases had lower odds of the last visit being an outpatient physical health visit compared with controls (OR, 0.38; 95% CI, 0.32-0.45; P < .001). The odds of an inpatient mental health visit did not differ between suicide cases and controls.

Association Among Health Care Visits, Clinical Characteristics, and Suicide

Table 5 shows associations among health care visits, clinical characteristics, and suicide. A greater number of mental health visits was associated with lower than expected odds of suicide. For every 5 mental health visits in the 30 days before the index date or suicide date, the odds of suicide decreased

Table 3. Frequency of Health Care Visits Among Participants With Health Care Visits

| Health care visit type, No. of visits | 1 mo Before death | | | 6 mo Before death | | |
| | No. (%) of participants[a] | | | No. (%) of participants[a] | | |
	Suicide cases (n = 408)	Controls (n = 1539)	P value	Suicide cases (n = 687)	Controls (n = 3669)	P value
Any MH or PH						
1	183 (44.9)	851 (55.3)		150 (21.8)	1167 (31.8)	
2-3	125 (30.6)	407 (26.4)	<.001	186 (27.1)	1109 (30.2)	<.001
≥4	100 (24.5)	281 (18.3)		351 (51.1)	1393 (38.0)	
Any MH						
0	204 (50.0)	898 (58.3)		320 (46.6)	2473 (67.4)	
1	75 (18.4)	261 (17.0)	<.001	93 (13.5)	244 (6.7)	<.001
≥2	129 (31.6)	380 (24.7)		274 (39.9)	952 (25.9)	
Any PH						
0	116 (28.4)	450 (29.2)		84 (12.2)	368 (10.0)	
1	183 (44.9)	796 (51.7)	.18	202 (29.4)	1375 (37.5)	.21
≥2	109 (26.7)	293 (19.0)		401 (58.4)	1926 (52.5)	

Abbreviations: MH, mental health; PH, physical health.

[a] Percentages may not total 100 owing to rounding.

Table 4. Location and Type of Last Visit Before Death or End of Study

| Health care visit type | No. (%) of participants[a] | | OR (95% CI) | P value |
	Suicide cases (n = 687)	Controls (n = 3669)		
Emergency MH	12 (1.7)	14 (0.4)	4.64 (2.14-10.08)	<.001
Emergency PH	133 (19.4)	405 (11.0)	1.94 (1.56-2.40)	<.001
Inpatient MH	3 (0.4)	5 (0.1)	3.21 (0.77-13.48)	.11
Inpatient PH	20 (2.9)	15 (0.4)	7.31 (3.72-14.34)	<.001
Outpatient MH	230 (33.5)	827 (22.5)	1.73 (1.45-2.06)	<.001
Outpatient PH	289 (42.1)	2403 (65.5)	0.38 (0.32-0.45)	<.001

Abbreviations: MH, mental health; OR, odds ratio; PH, physical health.

[a] Percentages may not total 100 owing to rounding.

approximately 22% (OR, 0.78; 95% CI, 0.65-0.92; P = .005). Diagnoses associated with a heightened risk for suicide included the mental health diagnoses of depression (OR, 3.19; 95% CI, 2.49-4.09; P < .001), bipolar or other mood disorder (OR, 2.09; 95% CI, 1.58-2.76; P < .001), schizophrenia or psychosis (OR, 3.18; 95% CI, 2.00-5.06; P < .001), and substance use disorder (OR, 2.65; 95% CI, 1.67-4.20; P < .001). The medical diagnosis of seizure disorder was also associated with suicide (OR, 4.89; 95% CI, 2.81-8.48; P < .001), whereas the diagnosis of cerebral palsy was associated with a lower odds of suicide (OR, 0.23; 95% CI, 0.07-0.81; P = .02).

Discussion

To the best of our knowledge, no previous studies have examined the clinical profiles and patterns of use of health and mental health services before suicide among children and adolescents within the Medicaid-enrolled population. Understanding how patterns of use of health care services among suicide decedents differ from those of the general population is critical to target suicide prevention efforts. In this multistate study of Medicaid enrollees, 41.3% of youths who died by suicide had at least 1 mental health diagnosis in the 6 months before death, a finding similar to those of previous studies on adults.[9] Youth

suicide was associated most prominently with diagnoses of schizophrenia, depression, bipolar disorder, and substance use, with the highest odds of youth suicide being associated with the psychiatric diagnoses of schizophrenia and depression. Although the prevalence of schizophrenia is relatively low in pediatric populations[11] and mood disorders are often considered among the most important remediable risk factors associated with youth suicide, study results call attention to prior research estimating that 10% of patients with schizophrenia will die by suicide across their life span and that suicide risk is 3 times higher for adolescents and young adults with schizophrenia than for affected adults.[12] Together, these findings suggest that youths with psychiatric disorders, particularly mood disorders, schizophrenia, and substance use disorder, should be routinely assessed for suicide risk and receive high-intensity, evidence-based treatments for suicidality such as cognitive behavioral therapy or dialectical behavioral therapy,[13] using models of care such as the Collaborative Assessment and Management of Suicidality.[14] Safety planning and means reduction should also be essential components of care for youths treated in outpatient behavioral health care.[15]

Most of the suicide decedents in our study did not have a mental health diagnosis. Because psychological autopsy studies report that more than 90% of youths who die by suicide have mental health diagnoses, the results suggest that

Table 5. Estimated Odds of the Association Among Health Care Visits, Clinical Characteristics, and Suicide

Variable	OR (95% CI)	P Value
Count of mental health visits, 5-U increase per 30 d	0.78 (0.65-0.92)	.005
Type of mental disorder		
ADHD	1.13 (0.88-1.44)	.35
Conduct[a]	1.18 (0.88-1.59)	.28
Depression	3.19 (2.49-4.09)	<.001
Bipolar and other mood disorders	2.09 (1.58-2.76)	<.001
Anxiety	1.20 (0.87-1.66)	.26
Schizophrenia or psychosis	3.18 (2.00-5.06)	<.001
Adjustment	1.43 (1.01-2.03)	.05
Other mental health conditions[b]	1.41 (0.996-1.99)	.05
Any substance use disorder	2.65 (1.67-4.20)	<.001
Dual diagnosis (substance use and mental health)	1.02 (0.57-1.83)	.95
Type of medical condition		
Asthma	1.28 (0.91-1.78)	.16
Cancer	0.80 (0.41-1.57)	.52
Congenital anomaly	0.59 (0.26-1.34)	.21
Seizure disorder	4.89 (2.81-8.48)	<.001
Diabetes	0.94 (0.43-2.06)	.88
Cerebral palsy	0.23 (0.07-0.81)	.02

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; OR, odds ratio.

[a] Includes oppositional defiant disorder.

[b] Includes all mental health disorders coded as *International Classification of Diseases, Ninth Revision, Clinical Modification,* diagnosis codes 290 to 319 not otherwise categorized above.

mental health conditions for youth enrolled in Medicaid may be unidentified or undertreated.[16] A prior study[17] has reported that 75% to 85% of children and youths in need of mental health services do not receive them. The Medicaid Early and Periodic Screening, Diagnosis and Treatment (EPSDT) law requires states to screen Medicaid-eligible children to detect physical health conditions.[18] Mental health and substance abuse screens are optional under the EPSDT guidelines, and primary care clinicians receive supplemental payments to administer behavioral health screens. State Medicaid and public behavioral systems may want to develop policies and procedures to increase the administration of behavioral health and substance use screens by pediatricians and physicians as recommended by the American Academy of Pediatrics.[19,20]

Beyond confirming the well-known association between suicide and mental disorders, Medicaid-enrolled suicide decedents were significantly more likely to have a chronic physical health condition than controls and were twice as likely to have claims documenting co-occurring mental and physical health conditions. Epilepsy emerged as the physical health condition most powerfully associated with youth suicide, a finding consistent with previous research reporting a 2.6 to 5.0 times higher risk of death by suicide in people with epilepsy.[21,22] The strong association between epilepsy and psychiatric disorders is well known,[23-27] with mood and anxiety disorders occurring more frequently among people with epilepsy than in the general population. Although the presence

of epilepsy is a risk factor for psychiatric disorders and suicide, evidence also suggests that specific antiepileptic drugs may increase the risk of suicidal behavior.[28-30] Associations of suicide risk with comorbid psychiatric disorders and antiepileptic drugs aside, epilepsy is a brain disorder in its own right[31] and may be associated with suicide risk in the absence of known psychiatric comorbidity and of antiepileptic medication. Findings point to the importance of using available tools to screen youths diagnosed with epilepsy for depression, assess for suicidality, and refer for psychiatric treatment if needed.

The observed association between a greater number of mental health visits and lower than expected likelihood of suicide in no way demonstrates causality but may offer some reassurance to hard-working mental health clinicians, given that the odds of suicide decreased approximately 22% for every 5 mental health visits in the 30 days before the index date. This finding highlights the importance of continuity of care, preferably with the same mental health professional, to ensure consistent monitoring of suicide risk, and referrals to follow-up care, including caring contacts and appointment reminders.

This study found that 75% of Medicaid-enrolled youths who died by suicide had accessed some form of health care services (ie, physical and/or mental health services) in the 6 months before death. In the month before death by suicide, 44.8% of suicide decedents had visited a health or mental health professional, and 204 of 910 (22.2%) made a specialty mental health visit. These findings in the Medicaid-enrolled population are consistent with previous research reporting health care visits for 80% and 40% of adults who died by suicide in the 1 year and 1 month before death, respectively.[4] Medicaid-enrolled youths who died by suicide were more likely than controls to receive services across all levels of care in the 1 and 6 months before death, including inpatient, emergency, and outpatient health and mental health settings. Although the outpatient visits were most prevalent for suicide decedents and controls and decedents were significantly more likely to present in outpatient health and mental health settings than controls at 1 and 6 months, differences between the groups and associated ORs were modest. In the present study, more prominent differences were noted between suicide cases and controls in the emergency department and inpatient settings, and 21.1% of suicide cases had their final visit in the emergency department. Most suicide decedents who were last seen in the emergency department did not have a recorded mental health diagnosis, consistent with prior studies[4,32] suggesting that many individuals who die by suicide after an emergency department visit do not present for ostensibly psychiatric reasons.

Study results provide conceptual support for the Zero Suicide model advanced by the National Strategy for Suicide Prevention that focuses suicide prevention efforts on health and behavioral health systems.[33] The Joint Commission's 2016 Sentinel Event Alert 56 recommended that hospital systems and primary, emergency, and behavioral health clinicians screen for suicide risk in nonacute and acute care settings.[34] National Patient Safety Goal 15 made screening individuals for suicidality a requirement in all behavioral health care settings and among those with a primary behavioral health condition.[35]

Routine screening for suicide risk in most health care settings nevertheless remains unusual. Although the American Academy of Pediatrics recommends screening children and adolescents for mental health conditions,[19,20] the US Preventive Services Task Force has concluded that existing evidence is insufficient to evaluate the risks and benefits of screening adolescents and adults for suicide risk in primary care settings.[36] State Medicaid and public behavioral systems may want to develop policies and procedures to increase the administration of behavioral health and substance use screens, particularly in primary care where most youth are seen.

Given existing uncertainties about when and where to best screen for suicide risk, study results provide some clues to future suicide prevention efforts with Medicaid-enrolled youths. Study findings suggest that youth presentations in emergency departments and on inpatient units may be times of particularly high risk and that screening for youth suicide risk in these settings might prove to be more high yield than screening efforts in routine ambulatory settings.[37] The Emergency Department Safety Assessment and Follow-up Evaluation[38] study is a prominent example of how screening for suicide risk in the emergency department in combination with a brief intervention administered during and after the visit significantly decreased the risk of subsequent suicidal behavior. From a diagnostic perspective, study results support screening and ongoing assessment of suicide risk for individuals with mental disorders, particularly mood disorders, schizophrenia, and substance use, as well as chronic physical health disorders, particularly epilepsy.

Limitations

This study has several limitations. First, although death certificates are the criterion standard for identifying deaths due to suicide, they nevertheless may misclassify or underestimate cases.[39,40] Similarly, it is not possible to validate the accuracy of the psychiatric or medical diagnosis codes entered in the Medicaid claims data. Second, all youths in this study were covered by Medicaid, and findings may not be applicable to youths with private insurance or the uninsured. Nevertheless, findings about the timing and type of care mirror those of other studies,[4,8] suggesting broad generalizability. Third, although our study included a large sample of Medicaid enrollees from all regions of the United States, not all states were represented. Fourth, findings are based on data from 2009 to 2013, before the implementation of Medicaid expansion under the Patient Protection and Affordable Care Act. Replication with current data and information about changes in Medicaid benefit packages is warranted. However, we believe the present findings can provide guidance for new or modified Medicaid reimbursement plans and coverage requirements.

Conclusions

This study found that Medicaid-enrolled youth who died by suicide were more likely to present in medical and mental health settings in the months before death compared with living controls, providing support for suicide prevention efforts targeting youth in health care settings as championed by the Zero Suicide model[33] and The Joint Commission.[34,35] Emergency departments and inpatient care settings may be particularly high-yield venues to identify youths at risk for suicide. Heightened suicide risk was associated with mood disorders, schizophrenia, substance use, and epilepsy, and greater exposure to mental health care may be associated with lower risk of suicide.

REFERENCES

1. Centers for Disease Control and Prevention. Welcome to WISQARS (Web-based Injury Statistics Query and Reporting System). Reviewed September 18, 2019. Accessed August 28, 2019. https://www.cdc.gov/injury/wisqars

2. Campo JV. Youth suicide prevention: does access to care matter? *Curr Opin Pediatr*. 2009;21 (5):628-634. doi:10.1097/MOP.0b013e32833069bd

3. US Department of Health and Human Services Office of the Surgeon General and National Action Alliance for Suicide Prevention. *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. US Dept of Health and Human Services; 2012.

4. Ahmedani BK, Simon GE, Stewart C, et al. Health care contacts in the year before suicide death. *J Gen Intern Med*. 2014;29(6):870-877. doi:10.1007/s11606-014-2767-3

5. Ilgen MA, Conner KR, Roeder KM, Blow FC, Austin K, Valenstein M. Patterns of treatment utilization before suicide among male veterans with substance use disorders. *Am J Public Health*. 2012; 102(suppl 1):S88-S92. doi:10.2105/AJPH.2011. 300392

6. Fontanella CA, Warner LA, Hiance-Steelesmith DL, et al. Service use in the month and year prior to suicide among adults enrolled in Ohio Medicaid. *Psychiatr Serv*. 2017;68(7):674-680. doi:10.1176/appi.ps.201600206

7. Ribeiro JD, Gutierrez PM, Joiner TE, et al. Health care contact and suicide risk documentation prior to suicide death: results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *J Consult Clin Psychol*. 2017;85(4): 403-408. doi:10.1037/ccp0000178

8. Ahmedani BK, Westphal J, Autio K, et al. Variation in patterns of health care before suicide: a population case-control study. *Prev Med*. 2019; 127:105796. doi:10.1016/j.ypmed.2019.105796

9. Yeh HH, Westphal J, Hu Y, et al. Diagnosed mental health conditions and risk of suicide

mortality. *Psychiatr Serv*. 2019;70(9):750-757. doi:10.1176/appi.ps.201800346

10. Bridge JA, Goldstein TR, Brent DA. Adolescent suicide and suicidal behavior. *J Child Psychol Psychiatry*. 2006;47(3-4):372-394. doi:10.1111/j.1469-7610.2006.01615.x

11. Gould MS, Greenberg T, Velting DM, Shaffer D. Youth suicide risk and preventive interventions: a review of the past 10 years. *J Am Acad Child Adolesc Psychiatry*. 2003;42(4):386-405. doi:10.1097/01.CHI.0000046821.95464.CF

12. Pompili M, Amador XF, Girardi P, et al. Suicide risk in schizophrenia: learning from the past to change the future. *Ann Gen Psychiatry*. 2007;6:10. doi:10.1186/1744-859X-6-10

13. Hogan MF, Grumet JG. Suicide prevention: an emerging priority for health care. *Health Aff (Millwood)*. 2016;35(6):1084-1090. doi:10.1377/hlthaff.2015.1672

14. Jobes DA. The Collaborative Assessment and Management of Suicidality (CAMS): an evolving evidence-based clinical approach to suicidal risk. *Suicide Life Threat Behav*. 2012;42(6):640-653. doi:10.1111/j.1943-278X.2012.00119.x

15. Stanley B, Brown GK, Brenner LA, et al. Comparison of the safety planning intervention with follow-up vs usual care of suicidal patients treated in the emergency department. *JAMA Psychiatry*. 2018;75(9):894-900. doi:10.1001/jamapsychiatry.2018.1776

16. Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. *Psychol Med*. 2003;33(3):395-405. doi:10.1017/S0033291702006943

17. Kataoka SH, Zhang L, Wells KB. Unmet need for mental health care among US children: variation by ethnicity and insurance status. *Am J Psychiatry*. 2002;159(9):1548-1555. doi:10.1176/appi.ajp.159.9.1548

18. US Department of Health and Human Services; Centers for Medicare & Medicaid Services. EPSDT: a guide for states: coverage in the Medicaid benefit for children and adolescents. Published June 2014. Accessed August 28, 2019. https://www.medicaid.gov/sites/default/files/2019-12/epsdt_coverage_guide.pdf

19. American Academy of Pediatrics Task Force on Mental Health (TFOMH). Appendix S4: the case for routine mental health screening. *Pediatrics*. 2010;125(suppl 3):S133-S139. doi:10.1542/peds.2010-0788J

20. Weitzman C, Wegner L; Section on Developmental and Behavioral Pediatrics; Committee on Psychosocial Aspects of Child and Family Health; Council on Early Childhood; Society

for Developmental and Behavioral Pediatrics; American Academy of Pediatrics. Promoting optimal development: screening for behavioral and emotional problems. *Pediatrics*. 2015;135(2):384-395. doi:10.1542/peds.2014-3716

21. Levira F, Thurman DJ, Sander JW, et al; Epidemiology Commission of the International League Against Epilepsy. Premature mortality of epilepsy in low- and middle-income countries: a systematic review from the Mortality Task Force of the International League Against Epilepsy. *Epilepsia*. 2017;58(1):6-16. doi:10.1111/epi.13603

22. Abraham N, Buvanaswari P, Rathakrishnan R, et al. A meta-analysis of the rates of suicide ideation, attempts and deaths in people with epilepsy. *Int J Environ Res Public Health*. 2019;16(8):E1451. doi:10.3390/ijerph16081451

23. Pellock JM. Defining the problem: psychiatric and behavioral comorbidity in children and adolescents with epilepsy. *Epilepsy Behav*. 2004;5 (suppl 3):S3-S9. doi:10.1016/j.yebeh.2004.06.010

24. Plioplys S. Depression in children and adolescents with epilepsy. *Epilepsy Behav*. 2003;4 (suppl 3):S39-S45. doi:10.1016/j.yebeh.2003.08.016

25. Piazzini A, Canevini MP, Maggiori G, Canger R. Depression and anxiety in patients with epilepsy. *Epilepsy Behav*. 2001;2(5):481-489. doi:10.1006/ebeh.2001.0247

26. Williams J, Steel C, Sharp GB, et al. Anxiety in children with epilepsy. *Epilepsy Behav*. 2003;4(6):729-732. doi:10.1016/j.yebeh.2003.08.032

27. Kanner AM. Psychosis of epilepsy: a neurologist's perspective. *Epilepsy Behav*. 2000;1 (4):219-227. doi:10.1006/ebeh.2000.0090

28. Patorno E, Bohn RL, Wahl PM, et al. Anticonvulsant medications and the risk of suicide, attempted suicide, or violent death. *JAMA*. Published correction appears in *JAMA*. 2010;303(22):2252. 2010;303(14):1401-1409. doi:10.1001/jama.2010.410

29. US Department of Health and Human Services Food and Drug Administration. Statistical review and evaluation: antiepileptic drugs and suicidality. Published May 23, 2008. Accessed February 7, 2020. https://www.fda.gov/files/drugs/published/Statistical-Review-and-Evaluation--Antiepileptic-Drugs-and-Suicidality.pdf

30. Brent DA, Crumrine PK, Varma R, Brown RV, Allan MJ. Phenobarbital treatment and major depressive disorder in children with epilepsy: a naturalistic follow-up. *Pediatrics*. 1990;85(6):1086-1091.

31. Hesdorffer DC, Ishihara L, Webb DJ, Mynepalli L, Galwey NW, Hauser WA. Occurrence and

recurrence of attempted suicide among people with epilepsy. *JAMA Psychiatry*. 2016;73(1):80-86. doi:10.1001/jamapsychiatry.2015.2516

32. Gairin I, House A, Owens D. Attendance at the accident and emergency department in the year before suicide: retrospective study. *Br J Psychiatry*. 2003;183:28-33. doi:10.1192/bjp.183.1.28

33. Brodsky BS, Spruch-Feiner A, Stanley B. The Zero Suicide model: applying evidence-based suicide prevention practices to clinical care. *Front Psychiatry*. 2018;9:33. doi:10.3389/fpsyt.2018.00033

34. Joint Commission. Sentinel Event Alert 56: detecting and treating suicide ideation in all settings. Published February 24, 2016. Accessed August 28, 2019. https://www.jointcommission.org/resources/patient-safety-topics/sentinel-event/sentinel-event-alert-newsletters/sentinel-event-alert-56-detecting-and-treating-suicide-ideation-in-all-settings/

35. Joint Commission. R³ report: requirement, rationale, reference. National Patient Safety Goal for Suicide Prevention. Updated May 6, 2019. Accessed August 28, 2019. https://www.jointcommission.org/-/media/tjc/documents/resources/patient-safety-topics/suicide-prevention/r3_18_suicide_prevention_hap_bhc_5_6_19_rev5.pdf?db=web&hash=887186D9530F7BB8E30C28FE352B5B8C

36. LeFevre ML; US Preventive Services Task Force. Screening for suicide risk in adolescents, adults, and older adults in primary care: US Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2014;160(10):719-726. doi:10.7326/M14-0589

37. Olfson M, Marcus SC, Bridge JA. Focusing suicide prevention on periods of high risk. *JAMA*. 2014;311(11):1107-1108. doi:10.1001/jama.2014.501

38. Miller IW, Camargo CA Jr, Arias SA, et al; ED-SAFE Investigators. Suicide prevention in an emergency department population: the ED-SAFE Study. *JAMA Psychiatry*. 2017;74(6):563-570. doi:10.1001/jamapsychiatry.2017.0678

39. Tøllefsen IM, Hem E, Ekeberg Ø. The reliability of suicide statistics: a systematic review. *BMC Psychiatry*. 2012;12:9. doi:10.1186/1471-244X-12-9

40. Kapusta ND, Tran US, Rockett IR, et al. Declining autopsy rates and suicide misclassification: a cross-national analysis of 35 countries. *Arch Gen Psychiatry*. 2011;68(10):1050-1057. doi:10.1001/archgenpsychiatry.2011.66