Health Services Use by Children in the Welfare System Who Died by Suicide

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abstract

OBJECTIVES: To examine characteristics and health service use patterns of suicide decedents with a history of child welfare system involvement to inform prevention strategies and reduce suicide in this vulnerable population.

METHODS: A retrospective matched case-control design (120 suicide decedents and 1200 matched controls) was implemented. Suicide decedents included youth aged 5 to 21 who died by suicide and had an open case in Ohio's Statewide Automated Child Welfare Information System between 2010 and 2017. Controls were matched to suicide decedents on sex, race, and ethnicity. Comparisons were analyzed by using conditional logistic regressions to control for matching between the suicide and control groups.

RESULTS: Youth in the child welfare system who died by suicide were significantly more likely to experience out-of-home placements and be diagnosed with mental and physical health conditions compared with controls. Suicide decedents were twice as likely to access mental health services in the 1 and 6 months before death, regardless of the health care setting. A significantly higher percentage of suicide decedents used physical health services 6 months before their death or index date. Emergency department visits for both physical and mental health conditions were significantly more likely to occur among suicide decedents.

CONCLUSIONS: Suicide decedents involved in the child welfare system were more likely to use both mental and physical health care services in the months before their death or index date. Findings suggest that youth involved in the child welfare system may benefit from suicide prevention strategies in health care settings.

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WHAT'S KNOWN ON THIS SUBJECT: Suicide is a leading cause of death among youth in the United States. Youth in the child welfare system are at an elevated risk for suicide and likely to have severe mental and physical health conditions that require health services.

WHAT THIS STUDY ADDS: Health service use for suicide decedents involved in the child welfare system has not previously been studied. Understanding characteristics and health service use of suicide decedents with child welfare system involvement can advance suicide prevention efforts in this understudied population.

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Suicide is the second leading cause of death among youth aged 5 to 21 years in the United States, with rates increasing 50% between 2009 and 2018.[1,2] To support their vision for a "nation free from the tragic experience of suicide," the National Action Alliance for Suicide Prevention established a research agenda to reduce the annual suicide rate 20% by 2025.[3] This agenda includes focusing on "boundaried populations" at an elevated risk for suicide, referring to persons defined by an organizational function or service setting who may benefit significantly from suicide prevention efforts.[3] Youth involved in the child welfare system represent an important boundaried population for whom the risk of suicide is particularly concerning.

In 2018, 678 000 confirmed cases of child abuse and neglect were reported in the United States, equivalent to a rate of 9.2 victims per 1000 youth.[4] Existing literature suggests a significant linkage between child welfare involvement and suicidal behavior.[5–9] One study revealed that suicide rates over a 10-year period were 3.5 times higher among youth aged 5 to 17 years in the child welfare system than youth in the general population.[5] A meta-analysis further revealed that youth involved in the child welfare system were more likely to have a history of suicide ideation (24.7% vs 11.4%) and attempt (3.6% vs 0.8%) compared with youth with no system involvement.[6] Similarly, a study of youth aged 12 to 17 years with previous child welfare system involvement were 4 times more likely to have attempted suicide compared with youth not involved in the child welfare system.[7]

Between 30% and 80% of youth who come into contact with the child welfare system have mental health conditions, developmental delays, or other circumstances requiring health services.[10–12] Health care providers are critical to suicide prevention strategies.[13] Integrating suicide prevention strategies as a core component of health care delivery and providing access to effective health services for individuals at risk for suicide are primary goals of the US Surgeon General and the National Action Alliance for Suicide Prevention.[14] To the best of our knowledge, there have been no studies on health service patterns of youth suicide decedents involved in the child welfare system.[15–17] In the current study, we address a critical knowledge gap by comparing characteristics and health service use of suicide decedents and nondecedents with child welfare system involvement. Findings can be used to identify targets for suicide prevention strategies in health care settings and inform efforts to reduce barriers to health services. On the basis of previous research,[12,18–20] we hypothesized that youth with child welfare system involvement who die by suicide are more likely to visit health care settings, experience more out-of-home placements,[21–23] and have a recognized mental and/or substance use disorder than youth in the nondecedent comparison group.[10–12]

METHODS

In this retrospective matched case-control study, we used data on youth aged 5 to 21 years with an open case in Ohio's Statewide Automated Child Welfare Information System between 2010 and 2017. Open cases were defined as any investigated child maltreatment case in which the child or family received services or the child was removed from the home. Death certificate data were obtained from Ohio's Department of Vital Statistics to identify suicide deaths on the basis of *International Classification of Diseases, 10th Revision* codes X60–X84, Y87.0, and *U03.[24] Death certificate records were merged with child welfare and Medicaid data on the basis of an algorithm used in previous studies that incorporates the social security number, date of birth, and sex.[25–27] For each decedent, 10 controls were selected to ensure adequate statistical power and matched on sex, race (white, Black, or other), ethnicity (Hispanic or not), age (date of birth ± 1 year), and year of open case (±1 year). Race and ethnicity were categorized on the basis of subject reports and were included in the criteria for matched controls as possible confounders associated with health service use and suicide outcomes in this study. Research reveals that significant racial and ethnic disparities exist in health service use, with the needs of minority racial and ethnic groups largely unmet.[28–30] In addition, although suicide rates in the United States have traditionally been higher among white youth, recent evidence reflects increasing rates among youth in other racial and ethnic groups.[31,32] The final sample included 1320 youth with child welfare involvement (n = 120 suicide decedents; n = 1200 matched controls). Age during the open case, sex, race, and ethnicity were obtained from Ohio's Statewide Automated Child Welfare Information System. Diagnoses and service use information was extracted from Medicaid claims data. The study was approved by the Institutional Review Board of The Abigail Wexner Research Institute at Nationwide Children's Hospital.

Measures

Service Use

Information was obtained on outpatient, inpatient, and emergency department visits in the 6 months before death by suicide or the index date. Treatment visits were categorized as mental and primary care health visits. Mental health visits were defined as those with a mental health diagnosis (*International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] or *International Classification of Diseases, 10th Revision, Clinical Modification* [ICD-10-CM] codes 290–319 and F01–F99) or mental health procedure code (eg, diagnostic interview, pharmacologic management, psychotherapy, case management, or crisis intervention) by a specialty (eg, psychiatrist or psychologist) or nonspecialty

provider (eg, primary care). General health visits were physical health–related visits to a primary care provider or medical specialist and included routine wellness visits, vaccinations, and illness-related visits for colds, flu, injuries, and physical conditions, such as asthma, diabetes, epilepsy, and cancer.

Clinical Characteristics

Clinical characteristics included psychiatric diagnoses and chronic medical conditions. Psychiatric diagnoses were grouped into categories based on ICD-9-CM and ICD-10-CM codes: no psychiatric diagnosis, attention-deficit/hyperactivity disorder (ADHD), conduct disorders, depression, bipolar disorder, anxiety disorders, schizophrenia or psychosis, adjustment disorders, substance use, and other mental health disorder. The following chronic medical conditions were examined: diabetes, seizure disorders, cerebral palsy, asthma, cancer, congenital anomalies, major organ disease, autoimmune disease, immunocompromised condition, congenital heart disease, and sickle cell disease (Supplemental Table 4).

Child Welfare Characteristics

Two variables were created to capture characteristics of child welfare involvement. The number of open cases involving the child during the study period was coded as 1, 2, 3, or ≥4. A dichotomous variable indicated if the youth was ever removed from the home.

Statistical Analysis

Characteristics, location, and type of health care visit between suicide decedents and matched controls were compared by using conditional logistic regression. Individuals who had a health care visit within the 6 months before their death or index date were grouped on the basis of the location and type of the last visit (eg, outpatient mental health, inpatient physical health, etc). The frequency of health care visits was examined for participants who had any visit within the 1- and 6-month periods before their death or index date. χ^2 tests were used to estimate differences in frequency by visit type. All analyses were conducted by using SAS version 9.4 (SAS Institute, Inc, Cary, NC), with significance set at $P < .05$.

RESULTS

The study sample was 65.8% male, with 63% identified as non-Hispanic white, 25.0% as non-Hispanic Black, and 4.2% as Hispanic. The majority of youth were 15 to 19 years old when their child welfare case was opened (43.6%), with an average age of 15.4 years (SD = 3.6) (Supplemental Table 5). The number of open cases did not significantly differ between the 2 groups (Table 1). Approximately half of each group (48.3% of suicide decedents; 50.8% of controls) had only 1 open case, and 16.7% of suicide decedents and 15.2% of controls had ≥4 open cases. Suicide decedents were significantly more likely than controls to have been placed in foster care, kinship care, or other setting (odds ratio [OR] = 2.01 [95% confidence interval (CI) = 1.11–3.66]; $P = .02$).

More than half of the suicide decedents had a diagnosed mental health condition (59.2%) compared with less than one-third of the control group (31.3%). The suicide decedent group had significantly higher odds of all mental health diagnoses than the control group, except for ADHD, which was not significant. The suicide decedent group was also more likely to have multiple mental health diagnoses, with one-quarter having ≥3 diagnosed conditions (25.8%) compared with only 6.4% of the control group. Substance use disorders, as well as co-occurring mental health and substance use disorders, were significantly more prevalent in the suicide decedent group compared with controls (30.8% vs 12.3% and 23.3% vs 6.7%, respectively). Among both groups, mental health conditions were more common than chronic medical conditions; however, significantly more suicide decedents than controls were diagnosed with seizure disorders (4.2% vs 1.2%) and major organ disease (5.0% vs 0.3%). Suicide decedents were significantly more likely to have a previous history of self-harm than nondecedents (6.7% vs 0.4%).

Almost half of suicide decedents (47.5%) were seen in any health care setting within 1 month of the index date compared with only 35.8% of controls (Table 2). The overwhelming majority of suicide decedents (90%) had a health care visit, most commonly in an outpatient setting (75.8%), in the 6 months before their death or index date, compared with 69.4% of controls. Odds of a mental health visit were significantly greater for suicide decedents, regardless of whether the visit occurred during the 1- or 6-month period and regardless of the setting (ie, inpatient, outpatient, or emergency department visit). Physical health visits were more likely to occur among suicide decedents than controls within 6 months of their death or index date but not within 1 month. Suicide decedents were significantly more likely to visit emergency departments for physical health issues than controls at both 1 month (OR = 2.57 [95% CI = 1.56–4.24]; $P < .001$) and 6 months (OR = 2.63 [95% CI = 1.79–3.87]; $P < .001$), with 55.8% of suicide decedents visiting an emergency department within 6 months and 21.7% within 1 month of death.

The frequency of health care visits by type is shown in Table 3. During the 1 and 6 months before their death or index date, there were no significant differences in the frequency of any health care or physical health care visits between suicide decedents and controls. The number of mental health care visits was statistically greater for suicide decedents in the 6 months before their death or index date than for controls, with decedents more likely to have multiple visits.

TABLE 1 Characteristics of Youth Suicide Decedents and Matched Controls in the Child Welfare System Aged 5–21 Years in the 6 Months Before Death by Suicide or Index Date

	No. Participants (%)		OR	95% CI	*P*
	Suicide Decedents (*n* = 120)	Controls (*n* = 1200)			
Child welfare variables[a]					
No. open cases during study					
1	58 (48.3)	609 (50.8)	1.00	—	—
2	28 (23.3)	265 (22.1)	1.12	0.69–1.81	.65
3	14 (11.7)	144 (12.0)	1.04	0.56–1.96	.90
4+	20 (16.7)	182 (15.2)	1.19	0.66–2.14	.57
Any out-of-home placement	15 (12.5)	81 (6.8)	2.01	1.11–3.66	.02
Clinical characteristics[a]					
Mental health diagnosis (any)	71 (59.2)	376 (31.3)	3.39	2.28–5.04	<.001
Depression	35 (29.2)	109 (9.1)	4.43	2.80–7.00	<.001
Bipolar disorder	23 (19.2)	57 (4.8)	4.99	2.90–8.59	<.001
Schizophrenia	14 (11.7)	22 (1.8)	6.36	3.26–12.44	<.001
Anxiety disorder	32 (26.7)	103 (8.6)	4.16	2.60–6.67	<.001
Conduct disorder or ODD	17 (14.2)	80 (6.7)	2.42	1.35–4.33	.02
ADD or ADHD	21 (17.5)	143 (11.9)	1.61	0.96–2.71	.07
Adjustment disorder	12 (10.0)	62 (5.2)	2.04	1.07–3.91	.03
Other	34 (28.3)	117 (9.8)	3.73	2.38–5.84	<.001
No. MH diagnoses					
0	49 (40.8)	824 (68.7)	1.00	—	—
1	27 (22.5)	194 (16.2)	2.43	1.47–4.02	<.001
2	13 (10.8)	105 (8.8)	2.31	1.19–4.48	.01
3+	31 (25.8)	77 (6.4)	6.92	4.15–11.55	<.001
Substance use disorder	37 (30.8)	148 (12.3)	4.00	2.45–6.51	<.001
Co-occurring mental health and substance abuse conditions	28 (23.3)	80 (6.7)	4.98	2.95–8.41	<.001
Chronic medical condition (any)	21 (17.5)	134 (11.2)	1.69	1.02–2.79	.04
Asthma	10 (8.3)	91 (7.6)	1.11	0.56–2.20	.76
Seizure disorder	5 (4.2)	14 (1.2)	3.57	1.29–9.92	.01
Major organ disease	6 (5.0)	4 (0.3)	15.0	4.23–53.15	<.001
Co-occurring mental health and chronic medical conditions	13 (10.8)	80 (6.7)	1.70	0.92–3.16	.09
Co-occurring mental health, substance abuse, and chronic medical conditions	6 (5.0)	25 (2.1)	2.53	1.00–6.37	.05
Previous self-harm	8 (6.7)	5 (0.4)	16.00	5.23–48.91	<.001

ADD, attention deficit disorder; MH, mental health; ODD, oppositional defiance disorder; —, indicates a category of comparison for the other categories in the logistic regression analysis.
[a] Conditional logistic regression based on matched pairs used for clinical characteristics and child welfare variables.

DISCUSSION

Research on youth in the child welfare system who die by suicide is minimal, limiting our ability to develop empirically informed prevention strategies. This is the first identified study in which differences in characteristics and health service use patterns between suicide decedents and nondecedents in this understudied population are examined. Consistent with evidence in the general population,[32] our results reveal that youth suicide decedents involved in the child welfare system are more likely to be older, white (non-Hispanic), and male. Youth in the child welfare system who experienced out-of-home placements were twice as likely to die by suicide, which aligns with previous research on suicide ideation and attempts in maltreated youth.[21–23] Taussig et al[21] found that more frequent and longer periods of time in out-of-home placements strongly predicted suicidal behavior, and an additional study revealed that maltreated youth removed from their homes were 5 times more likely to exhibit suicidal behavior compared with youth not involved in the child welfare system.[22]

Approximately two-thirds of decedents were diagnosed with a mental health condition, which was significantly higher than the proportion in nondecedents. The most notable differences were found in youth diagnosed with schizophrenia, depression, bipolar disorder, and co-occurring mental health and substance use disorders. Youth with multiple mental health diagnoses were also more likely to die by suicide. Although mood and substance use disorders are considered the most common and remediable psychiatric conditions associated with suicide,[32–34] our finding that youth with schizophrenia were 6 times more likely to die by suicide underscores previous research[35,36] suggesting that suicide is a leading cause of death in patients with schizophrenia. In these same studies, the authors report that suicide risk is significantly higher for youth with schizophrenia compared

TABLE 2 Health Service Use of Youth Suicide Decedents and Matched Controls in the Child Welfare System Aged 5–21 Years by Time Period in the 6 Months Before Death by Suicide or Index Date

Health Services	1 mo					6 mo				
	No. Participants (%)		OR	95% CI	*P*	No. Participants (%)		OR	95% CI	*P*
	Suicide Decedents (*n* = 120)	Controls (*n* = 1200)				Suicide Decedents (*n* = 120)	Controls (*n* = 1200)			
Any	57 (47.5)	429 (35.8)	1.65	1.12–2.42	.01	108 (90.0)	833 (69.4)	4.28	2.30–7.96	<001
Inpatient	8 (6.7)	18 (1.5)	5.04	2.06–12.32	<.001	22 (18.3)	56 (4.7)	5.01	2.85–8.80	<.001
Outpatient	48 (40.0)	382 (31.8)	1.45	0.98–2.15	.06	91 (75.8)	756 (63.0)	1.95	1.24–3.06	.003
Emergency department	26 (21.7)	114 (9.5)	2.74	1.68–4.46	<.001	67 (55.8)	356 (29.7)	3.10	2.10–4.56	<.001
Mental health services	34 (28.3)	201 (16.8)	2.02	1.31–3.12	.002	60 (50.0)	374 (31.2)	2.31	1.56–3.41	<.001
Inpatient	6 (5.0)	8 (0.7)	7.50	2.60–21.62	<.001	16 (13.3)	20 (1.7)	9.08	4.52–18.26	<.001
Outpatient	33 (27.5)	196 (16.3)	2.00	1.29–3.11	.002	57 (47.5)	365 (30.4)	2.16	1.46–3.20	<.001
Emergency department	4 (3.3)	11 (0.9)	3.75	1.17–12.04	.03	17 (14.2)	37 (3.1)	5.32	2.86–9.91	<.001
Physical health services	40 (33.3)	323 (26.9)	1.37	0.91–2.06	.13	94 (78.3)	750 (62.5)	2.28	1.44–3.61	<.001
Inpatient	2 (1.7)	10 (0.8)	2.07	0.43–9.89	.36	8 (6.7)	39 (3.3)	2.22	0.99–5.02	.05
Outpatient	27 (22.5)	263 (21.9)	1.04	0.66–1.64	.88	75 (62.5)	651 (54.3)	1.45	0.97–2.17	.07
Emergency department	24 (20.0)	109 (9.1)	2.57	1.56–4.24	<.001	61 (50.8)	345 (28.8)	2.63	1.79–3.87	<.001
No services	63 (52.5)	771 (64.3)	0.61	0.41–0.89	.01	12 (10.0)	367 (30.6)	0.23	0.13–0.43	<.001

with adult patients with schizophrenia.[35,36]

Suicide decedents involved in the child welfare system were also more likely to have a chronic medical condition than controls, a finding consistent with previous reports of a 2 to 3 times higher risk for suicide in youth who are chronically ill.[37,38] Results that youth with seizure disorder were 4 times more likely to die by suicide corroborate previous studies indicating that seizure disorder is strongly associated with an increased risk for suicide.[39,40]

Youth involved in the child welfare system who experienced co-occurring mental, medical, and substance use conditions were 2.5 times more likely to die by suicide compared with controls. Our finding that 6.7% of suicide decedents had a history of self-harm is met with mixed results in the existing literature. In select studies of youth involved in the child welfare system, authors reported rates ranging from 4% to 6%,[5,9,21,22] whereas additional studies indicate rates as high as 30%, depending on the population characteristics.[6,7]

TABLE 3 Frequency of Health Care Visits Among Youth Suicide Decedents and Matched Controls in the Child Welfare System Aged 5–21 in the 6 Months Before Death by Suicide or Index Date

Health Care Visit Type	1 mo		*P*	6 mo		*P*
	No. Participants (%)			No. Participants (%)		
	Suicide Decedents (*n* = 57)	Controls (*n* = 429)		Suicide Deceadents (*n* = 108)	Controls (*n* = 833)	
Any MH or PH			.74			.68
1	22 (38.60)	180 (41.96)		23 (21.30)	175 (21.01)	
2–3	15 (26.32)	120 (27.97)		23 (21.30)	209 (25.09)	
4+	20 (35.09)	129 (30.07)		62 (57.41)	449 (53.90)	
Any MH			.15			.02
0	23 (40.35)	228 (53.15)		48 (44.44)	459 (55.10)	
1–2	14 (24.56)	94 (21.91)		11 (10.19)	107 (12.85)	
3+	20 (35.09)	107 (24.94)		49 (45.37)	267 (32.05)	
Any PH			.32			.45
0	17 (29.82)	106 (24.71)		14 (12.96)	83 (9.96)	
1–2	30 (52.63)	269 (62.70)		44 (40.74)	385 (46.22)	
3+	10 (17.54)	54 (12.59)		50 (46.30)	365 (43.82)	

MH, mental health; PH, physical health.

Close to half (48%) of youth in the child welfare system who died by suicide used some type of health care services in the 1 month before their death or index date, and almost 90% did so in the preceding 6 months. These results are consistent with a study of Medicaid-enrolled youth revealing that 45% and 76% of suicide decedents accessed health care services in the 1 and 6 months before death, respectively.[41] Suicide decedents were twice as likely to access mental health services within both time periods compared with nondecedents, which may be related to the higher percentage of suicide decedents diagnosed with a mental health condition. Youth in the child welfare system who died by suicide were also more likely to have received mental health–related inpatient and emergency department services. These findings raise potential concerns about the quality and consistency of the services suicide decedents may have received to prevent more critical care associated with inpatient and emergency department visits.[9,42] Youth who died by suicide were also more likely to have multiple mental health visits compared with nondecedents in the 6 months before their death or index rate.

The study results have implications for suicide prevention in youth with child

welfare system involvement, most notably more frequent and ongoing suicide risk assessment and the development and implementation of tailored prevention programs. Together with previous evidence,[21–23] the finding that suicide decedents were more likely to be removed from their homes may support family preservation programs endorsed by recent federal legislation[43] or at least press for more careful monitoring of youth during this period of heightened risk. Although most suicide decedents had a mental health diagnosis (59%), authors of psychological autopsy studies report that >90% of youth who die by suicide have a mental health condition,[44] suggesting the potential utility of more robust mental health screening and suicide risk assessment for youth in the child welfare system.

It has been determined in previous studies that only 15% to 30% of youth involved in the child welfare system who require mental health services actually obtain appropriate care.[12,18,45] The authors of these same studies report that youth placed in nonkinship foster care were more likely to receive mental health services than those who stayed with families.[12,18,45] These findings may be reflective of traditional best practices developed to improve mental health services specifically for youth in foster care[46] rather than address the unique needs of the large number of youth with child welfare system involvement who remain at home. Recent policies aligned with family preservation practices hold promise by expanding capabilities to improve access to and quality of mental health care for all youth in the child welfare system.[43,46,47]

The findings highlight the importance of suicide prevention strategies for youth in the child welfare system who have mental health diagnoses, particularly depression, mood disorders, and schizophrenia, and those with chronic medical conditions, particularly conditions directly affecting the brain, such as seizure disorders. Identifying when and where to best screen for suicide risk can help target suicide prevention efforts. The significant number of inpatient unit and emergency department presentations for youth with child welfare involvement who died by suicide validates growing recommendations to screen for suicide risk in these health care settings.[9,18,42] Our study results further suggest that youth involved in the child welfare system may benefit from suicide prevention strategies, such as the Zero Suicide approach developed for health and behavioral health care systems.[48] Providing empirical support for suicide prevention programs developed specifically for youth involved in the child welfare system is an important area for future research.

Interventions with demonstrated efficacy for the treatment of youth involved in the child welfare system and youth suicidal behavior, such as cognitive behavioral therapy, could provide encouraging solutions.[49,50] In addition, many youth involved in the child welfare system have a complex history of trauma that justifies a trauma-informed approach to suicide prevention.[51,52] An empirically supported intervention based on cognitive behavioral principles, trauma-focused cognitive behavioral therapy, may offer integrated treatment of youth in the child welfare system who have co-occurring trauma and suicidal behavior.[53,54]

This study is not without limitations. First, the sample for this study is youth with involvement in the Ohio child welfare system, and results may not be fully generalizable to other states. However, Ohio is geographically and demographically diverse, and findings will likely be relevant to other child welfare populations in the United States. Second, youth in this study were enrolled in Medicaid, and findings may not be applicable to uninsured youth or those with private insurance. Results may also not apply to youth with child welfare involvement who are enrolled in other state Medicaid programs given differences in services and reimbursement options. Third, although previous suicide attempts is an important indicator for future suicidal behavior, the current study is restricted to the reporting of overall self-harm. In the absence of suicidal intent with self-harm, the administrative data used in this study do not specifically measure suicide attempt. Finally, psychiatric and medical diagnosis codes entered in the Medicaid claims data could not be validated for accuracy. Similarly, death certificate data commonly used to identify suicide deaths may be misclassified and underestimated.

CONCLUSIONS

Youth in the child welfare system who experienced out-of-home placements were associated with a heightened risk for suicide, lending support for suicide prevention efforts that align with family preservation programs.[40] Suicide decedents were more likely to be diagnosed with mental health and chronic medical conditions compared with controls and were also more likely to present in mental and physical health care settings in the months before their death or index date. Findings suggest that youth with child welfare involvement may benefit from suicide prevention strategies targeting health care settings.

ABBREVIATIONS

ADHD: attention-deficit/hyperactivity disorder
CI: confidence interval
ICD-9-CM: *International Classification of Diseases, Ninth Revision, Clinical Modification*
ICD-10-CM: *International Classification of Diseases, 10th Revision, Clinical Modification*
OR: odds ratio

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