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A Population-Based Examination of Suicide and Child Protection System Involvement

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 A B S T R A C T

Purpose: The purpose of this study was to provide a population-based analysis of child protection system (CPS) involvement among children and adolescents who died by suicide.

Methods: We performed a case–control study of child and adolescent suicide and CPS involvement. Using linked birth, death, and CPS records, we longitudinally followed all children born in California in 1999 and 2000 ($N = 1,052,333$) in CPS and death records through 2017. Cases were defined as children who died in California and had a manner of death coded as suicide using the International Classification of Diseases, 10th revision ($n = 170$). Each suicide case was matched to four living controls, and children were classified based on CPS exposure: no history, reported for alleged child maltreatment, substantiated for child maltreatment, and placed in foster care. Crude suicide rates were documented, and conditional logistic regression models were used to estimate the adjusted odds of suicide.

Results: Among children and adolescents who died by suicide, 56.5% had a history of past allegations of abuse or neglect. Children with any CPS history had three times the odds of suicide compared to children with no history. No additional risk was found for children substantiated or placed in foster care compared to children with only an allegation.

Conclusions: Suicide risk is not isolated to the relatively small group of children and youth placed in foster care. Findings reinforce the importance of increased attention to the experiences of the larger universe of children who remain at home after alleged or substantiated maltreatment.

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 IMPLICATIONS AND
 CONTRIBUTION

Prior reports of maltreatment are common among children and youth who died by suicide. Findings reinforce the importance of preventive services, mental health screening, and other targeted supports for children and youth who are reported to CPS during childhood.

Although suicide overall remains a rare event, the rate of fatal self-harm among children and adolescents has risen dramatically during the past decade. Between 2008 and 2018, suicide rates

among 10- to 18-year-olds increased by more than 50%, surpassing homicide and positioning suicide as the second leading cause of death among adolescents [1]. Several factors have been associated with increased risk of suicide, including a history of exposure to childhood maltreatment and involvement with the child protection system (CPS) [2,3]. Estimates of childhood maltreatment can vary significantly based on definitions, maltreatment type, and the approach to data collection [4,5]. But official records of CPS involvement provide a method for documenting the universe of children for whom the community at

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large had concerns and an agency response or intervention was possible, given that an allegation of maltreatment was made. In the United States, the number of children reported to CPS is staggering. An estimated one in three children experience an investigation for alleged maltreatment, and one in eight children are confirmed as victims of abuse or neglect by age 18 years [6–8].

Attention to this larger population of children who are reported to CPS but may not be designated a victim or receive services [9,10] has increased in recent years. Still, an understanding of differences in outcomes among alleged versus confirmed victims of childhood maltreatment, including risk of death, is still emerging. Published studies have tended to focus on inflicted injury deaths due to abuse or neglect [11–13]. Yet other studies documented a high prevalence of mental health problems among children investigated by CPS, suggesting that these children may also be at heightened risk of self-harm and suicide [14]. To date, only three studies have examined suicide deaths in a population-based cohort of children and youth involved with CPS agencies [15–17]. All three studies documented higher rates of suicide among children and youth involved with CPS than the general population. Each of these studies, however, was conducted outside of the United States. This is important given that the U.S. adolescent suicide rate is higher than the mean adolescent suicide rate worldwide [1,18] and although suicide rates across the globe have been declining, in the United States, adolescent suicide rates continue to rise [1]. Each study also focused on a small and arguably more vulnerable subset of maltreated children and youth: those placed in foster care. It is currently unknown if the much larger population of children and youth who come into contact with CPS through reports of alleged child maltreatment also face an elevated risk of suicide. In addition, a limited number of studies using psychological autopsies and death records have demonstrated a direct relationship between child maltreatment and adolescent suicide; however, these studies have also been limited by small sample size and differing definitions of child maltreatment [2,3,19].

In the present study, we extended the literature through a population-based, longitudinal case–control study of suicide risk and CPS involvement. Using linked birth, death, and CPS records, we examined differences in suicide rates among children and youth with (a) no CPS history, (b) a report of alleged child maltreatment, (c) a substantiated report of child maltreatment, or (d) foster care placement.

Methods

Data

An integrated data set of linked records was constructed from California sources: vital birth and vital death records were obtained through the California Department of Public Health; CPS records (reports of alleged abuse, investigation dispositions, foster care placements) fell under the authority of the California Department of Social Services and were available through a data-sharing agreement. Birth records were probabilistically linked to both death and CPS records using a combination of nonunique identifiers (e.g., first name, last name, date of birth, address). Records were linked with an open-source algorithm trained using machine learning methods [20]. This probabilistic linkage algorithm uses a large number of comparison functions on

nonunique person identifiers with more than 5,000 scored record pairs. The false positive rate (2.7%) and false negative rate (1.3%) fell within expected boundaries for this approach [21]. The final analytic data set consisted of all children with a registered birth in California between January 1, 1999, and December 31, 2000 ($N = 1,052,333$). This cohort of children was then prospectively followed up through linked CPS and death records through 2017, with each child coded and classified as described in the following sections. All linkages and analyses were governed by strict data-security protocols that were reviewed and approved by the state and university institutional review boards. All data linkage and analytic work took place between July 2019 and February 2020.

Cases

Suicide cases were classified based on external cause of death as recorded in vital records and coded using the International Classification of Diseases, 10th Revision [22]. These codes include e-codes that allow for the identification of the manner of death (i.e., natural, accidental, suicide, homicide, undetermined, pending). Cases included any child born in California in 1999 or 2000 and who died in California between birth and 2017 with a manner of death coded as suicide (X60–84; $n = 170$).

Controls

Matched controls were selected from the population of children born in 1999 or 2000. Given documented demographic differences in suicide rates [2,23,24], controls were matched to cases as per sex, year of birth, maternal race and ethnicity, maternal age at birth, maternal education, and insurance type at birth (public vs. private). Matching was completed using Stata version 16.0 and the *joinby* function, which matches all possible controls for individual cases based on chosen match fields. Four controls were then randomly selected from all possible matched controls (2–2,690) [25]. Four controls were identified for 169 cases; one case only matched to two controls. All controls ($n = 678$) were cross-checked with linked death records to ensure that each individual was living as of the date of death associated with the matched case.

Exposure variables

Exposure variables captured CPS involvement during childhood. CPS exposure was coded for modeling purposes in two ways. First, CPS exposure was coded as a binary variable identifying any CPS involvement, defined as a history of one or more reports of alleged maltreatment versus no history of reports. Second, CPS exposure was coded such that each child was categorized based on the highest level of CPS involvement. For this coding, children were assigned to four mutually exclusive groups (no history, history of report but no substantiation, history of substantiation but no placement, foster care placement).

Analysis

Using information from birth records, we present the demographic characteristics of the overall study cohort, suicide cases, and living controls. Chi-square tests confirmed that cases and controls were equivalent on all matching variables. We used two conditional logistic regression models to determine

differences in suicide risk across CPS exposure. Conditional logistic regression models addressed the sparse data bias that can occur with a small number of cases [26]. All analyses were completed using Stata version 16.0.

Results

In Table 1, we present the demographic characteristics of the overall study cohort ($N = 1,052,333$) from which cases ($n = 170$) and matched controls ($n = 678$) were drawn. The mean age at time of death was 16 years ($SD = 1.52$). Notable differences emerged between the overall cohort and the subset of children and youth who died by suicide and were classified as cases. Suicide cases were more likely to be male (64.7%), born to white mothers (44.7%), and have had private insurance coverage at birth (62.9%). Figure 1 illustrates the percentage of cases and controls with a CPS history. Among youth who died by suicide, 56.5% had a history of CPS involvement before death versus 30.4% of demographic controls. Compared with controls, suicide cases were significantly more likely to have been reported, substantiated, and placed in foster care before death ($p < .001$).

Table 2 documents the crude suicide rates per 100,000 and estimates from the two conditional logistic regression models. Children and youth with no CPS history had a crude suicide rate of 10.0 per 100,000; children and youth who had any history of alleged abuse or neglect had a crude suicide rate of 30.6 per 100,000. Model 1 indicates that children with any CPS history had 3.6 times higher odds of suicide than children who had never been reported ($OR = 3.58$; 95% CI = 2.44, 5.25; $p < .001$). In model 2, we compared the suicide risk of children and youth who had no CPS history with those who had varying levels of interactions and responses after reported maltreatment. Findings indicate that children who were reported but never substantiated as a victim or placed in foster care had 3 times the odds of suicide ($OR = 3.07$; 95% CI = 2.02, 4.67; $p < .001$). Among children and

youth who were substantiated as victims but never placed in foster care, the odds of suicide were roughly 5 times that of children never reported ($OR = 5.16$; 95% CI = 2.76, 9.63; $p < .001$). Children and youth who had been placed in foster care had nearly 5 times the odds of suicide compared with children without any CPS involvement ($OR = 4.95$; 95% CI = 2.37, 10.30; $p < .001$). To further examine differences in suicide risk between youths with differing levels of CPS involvement, we reran model 2 and changed the reference group to children with reports only. When children with reports only were modeled as the reference group, we did not detect any statistically significant differences for children with substantiated maltreatment.

Discussion

Children and adolescents with a history of alleged maltreatment leading to CPS involvement have been identified as having increased risk of childhood suicide, yet studies exploring this relationship have almost exclusively focused on the more easily identified subset of children placed in foster care. To our knowledge, this is the first population-based study to examine suicide risk in the much larger universe of children and youth reported and substantiated as alleged victims of maltreatment.

Consistent with findings from earlier studies, our results indicate that children and youth with a history of placements in foster care have significantly higher odds of suicide before age 18 years [15–17]. However, our study extends the literature by illustrating that the risk is not unique to youth placed in foster care. Rather, our results suggest that the much larger universe of children and youth reported to the CPS system for alleged maltreatment face a similarly heightened risk of death by suicide. The finding that children and youth reported to CPS but never substantiated or placed in care have three times the risk of suicide compared with matched children who were never reported for maltreatment reinforces that a report itself may be an

Table 1
Sociodemographic and birth characteristics of all children, controls, and cases, California, United States, 1999–2000

	All children		Controls		Cases		
	$N = 1,052,333$		$n = 678^a$		$n = 170$		p^b
	N	col %	n	col %	n	col %	
Birth year							
1999	519,488	49.4	356	52.5	89	52.4	.97
2000	532,845	50.6	322	47.5	81	47.7	
Sex							
Male	538,539	51.2	440	64.9	110	64.7	.96
Female	513,784	48.8	238	35.1	60	35.3	
Mother's race and ethnicity ^c							
White	343,858	32.7	304	44.8	76	44.7	1.00
Asian or Pacific Islander	120,023	11.4	76	11.2	19	11.2	
Hispanic (U.S.-born)	184,226	17.5	156	23.0	39	22.9	
Hispanic (foreign-born)	330,956	31.5	100	14.8	25	14.7	
Black, other, or missing	73,270	7.0	42	6.2	11	6.5	
Mother's age at birth, M (SD), years	28.4 (.23)		28.4 (.26)		28.5 (.52)		.96
Mother's insurance type at birth							
Public	442,524	42.1	250	36.9	63	37.1	.96
Private	609,809	58.0	428	63.1	107	62.9	
Mother's level of education							
No high school diploma	311,524	29.6	164	24.2	41	24.1	.95
High school diploma	316,126	30.0	199	29.4	48	28.2	
Some college or college degree	424,683	40.4	315	46.5	81	47.7	

^a Control counts sum to 678 due to one case only having two exact matches.

^b $p < .05$ for difference between cases and controls, derived from χ^2 test.

^c Individuals who were Native American, black, or missing race and ethnicity data are reported together due to small cell sizes.

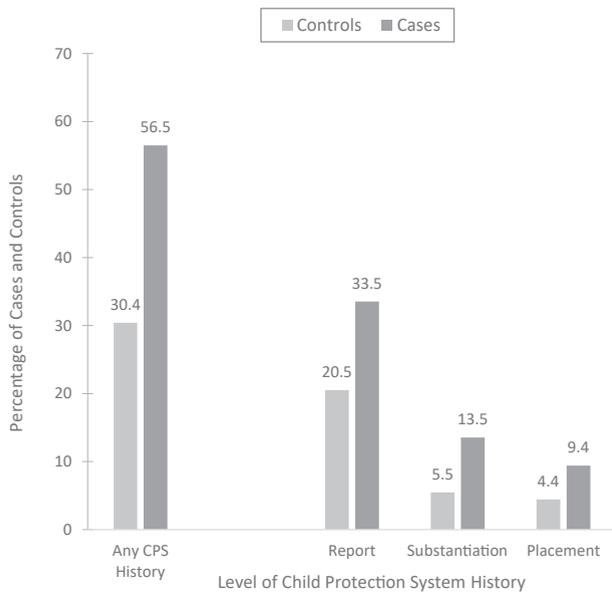


Figure 1. Percentage of cases and controls with any CPS history, report, substantiation, and prior foster care placements, California, United States, 1999–2017. Report, substantiation, and placement coded using mutually exclusive categories.

important signal of risk, as argued in other fatality studies [12]. Findings further suggest that whether or not there is evidence to substantiate child abuse or neglect, mental health and accompanying suicide risk may be substantially elevated among children who come to the attention of CPS.

More research is needed to determine if children and youth with allegations that were never substantiated are at heightened risk due to undetected abuse and neglect, or if other environmental (e.g., custody disputes) or child-related risks (e.g., behavioral problems) are being captured in CPS reports for those children [2,27,28]. Regardless, findings from this study indicate that most children and youth who died by suicide in California had interacted with CPS at some point during childhood. These findings reinforce the need for better screening and enhanced coordination of service referrals for children and youth who are alleged victims of abuse or neglect, even when there is no evidence to substantiate the maltreatment allegation. Prior research suggests that strengthening families through community-based programs aimed at improving a child's physical and emotional health generally can have numerous beneficial "cross-over" effects, including reduced suicidal behaviors [29,30]. That said, the

Table 2
Risk of suicide death by CPS history, California, United States, 1999–2017

	Crude rate per 100,000	OR	95% CI	<i>p</i> ^a
Model 1^b				
Any CPS history	30.56	3.58	2.44, 5.25	< .001
Model 2^c				
No history	10.02	ref		
Allegation	27.82	3.07	2.02, 4.67	< .001
Substantiation	35.56	5.16	2.76, 9.63	< .001
Foster care placement	35.88	4.95	2.37, 10.30	< .001

^a *p*-values derived from conditional logistic regression.

^b Binary coding of CPS history.

^c Mutually exclusive coding of CPS history.

sheer volume of children who are reported to CPS makes it highly unlikely that the front end of CPS can adequately investigate allegations of abuse and neglect (its primary charge), while also serving as an effective gateway to mental health services. CPS has a very specific charge during the investigation stage, which is when most families' contact with the system begins and ends. The system is neither funded nor situated in the community to operate as a mental health screening agency. Therefore, the most effective approach to suicide prevention is likely one that will strengthen CPS's ability to initiate referrals to community-based programs that have the potential to reduce adolescent suicide risk, while also emphasizing workforce training and awareness (i.e., understanding mental health) and cross-program information sharing to improve care coordination when appropriate.

Limitations

Although our study has the strength of population-based longitudinal administrative data, several limitations should be considered when interpreting these retrospective case–control results. The most important limitations relate to our inability to disentangle the specific contributions or timing of trauma, parental factors, and children's mental health conditions relative to CPS involvement and suicide. Only associations could be observed in this case–control study. Additional limitations related to the availability of data. Given the birth cohorts we examined, we had modestly right-censored deaths during childhood (i.e., children born in 2000 were only followed until the age of 17). It is also worth noting that cases were defined based on the conditions of having both been born and died in California. Although this should not have biased our estimated differences between cases and controls, it may mean that we have underestimated the suicide rate. In addition, because our controls were chosen using birth records, it is possible that some of these children and youth moved out of state between birth and the corresponding date of death of the matched case, which could lead to an underestimate of CPS involvement among controls. That said, the proportion of controls with a CPS history in this study mirrors other California population-level estimates [31]. Finally, the use of data exclusive to California means that it is unknown to what extent these findings would generalize to other jurisdictions or populations.

With the sharp rise in suicide deaths during the past decade, understanding the risk factors associated with child and adolescent suicide is an increasing public health concern. This study suggests that a heightened risk of suicide is not unique to children in foster care. Rather, findings reinforce the importance of preventive services, mental health screening, and other targeted supports for the much larger universe of children and youth who are reported to CPS during childhood.

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