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# A population-based case control study of suicide among youth reported for abuse and neglect

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## ARTICLE INFO

## Keywords:

Adolescent suicide  
Child protective services  
Child maltreatment

## ABSTRACT

**Background:** Research has indicated an association between child abuse and adolescent suicide. Little population-based information exists, however, about the nature of maltreatment experiences or interactions with the child protection system (CPS).

**Objective:** To examine child maltreatment characteristics and system-level responses associated with risk of adolescent suicide.

**Participants and setting:** Linked vital death records and CPS records were used to identify the population of adolescents who died by suicide in California between 2010 and 2017 and who had a history of at least one report to CPS prior to death.

**Method:** A case control design was used, with cases defined as a suicide of an adolescent with a history of CPS involvement. Using CPS records, living controls were then matched to cases based on year of birth, sex, race and ethnicity, and age of first child maltreatment allegation. A conditional logistic regression model was used to estimate the adjusted odds of adolescent suicide across various CPS and maltreatment characteristics.

**Results:** Recent CPS involvement, allegations of physical abuse, and allegations of sexual abuse emerged as significant risk factors for death by suicide. No differences in suicide risk were observed between youth with unsubstantiated or substantiated allegations.

**Conclusions:** Suicide risk appears to be more closely tied to specific maltreatment experiences than to substantiation or placement into foster care. As adolescent suicide rates rise, better understanding of risk factors among already vulnerable populations of youth is critical.

## 1. Introduction

Suicide remains a major public health concern nationwide, with 1 in every 10,000 adolescents dying by suicide (Centers for Disease Control & Prevention, 2020). The adolescent suicide rate increased 57 % from 2008 to 2018, and suicide is currently the second leading cause of death among 15- to 19-year-olds. Previous research has identified several risk factors associated with adolescent suicide, including child maltreatment (Brent, Baugher, Bridge, Chen, & Chiappetta, 1999; Shafii, Carrigan, Whittinghill, & Derrick, 1985). Few population-based studies exist on the relationship between child maltreatment and completed suicide, and those that have

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<https://doi.org/10.1016/j.chiabu.2021.105060>

Received 5 November 2020; Received in revised form 17 March 2021; Accepted 29 March 2021

Available online 9 April 2021

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been conducted have focused on suicide rates among children and the specific subset of adolescents currently placed or with a history of placement in foster care. These studies suggest that foster youth have suicide rates two to three times that of youth with no foster care history (Kalland, Pensola, Meriläinen, & Sinkkonen, 2001; Katz et al., 2011). A recent study of California youth extended this earlier research by including children with any history of child protection system (CPS) contact and found that youth who had been reported to CPS for alleged abuse or neglect had a significantly higher risk of suicide compared to youth with no such allegations (Palmer, Prindle, & Putnam-Hornstein, 2021). Findings from this population-based study suggest that a heightened risk of suicide may not be unique to foster youth but is a risk for the much larger universe of children who have had any previous allegations of maltreatment leading to involvement with CPS.

Recent estimates document that between 27 % and 37 % of U.S. children will be investigated by CPS for alleged child maltreatment (Kim, Wildeman, Jonson-Reid, & Drake, 2017; Putnam-Hornstein et al., 2021); approximately 12 % will be confirmed as victims and 5.3 % will spend time in foster care (Yi, Edwards, & Wildeman, 2020). Given these high rates, understanding potentially differential suicide risk among children with various levels of CPS contact is important to understanding service needs broadly. Although scarce, studies that have examined differential outcomes among youth with any history of CPS contact have found differences in risk by system response. Kugler et al. (2019) examined differential behavioral and mental health outcomes associated with levels of CPS contact (reported but not investigated, investigated but unsubstantiated, investigated and substantiated) among adolescent girls. Findings indicated differences in drug use, early childbearing, and HIV risk behaviors between those investigated versus not investigated, and differences in depression between those substantiated versus those not investigated. The Kugler study found no differences between those investigated but unsubstantiated and those substantiated. Similarly, Hussey et al. (2005) found no differences in behavioral and developmental outcomes of 8-year-olds between those with a substantiated or unsubstantiated CPS report, and Leiter, Myers, and Zingraff (1994) did not detect any differences in academic and delinquency outcomes between those with a substantiated or unsubstantiated CPS report.

Most studies examining the relationship between maltreatment and completed adolescent suicide have not differentiated between or examined individual types of abuse and neglect (Brent et al., 1999; Shafii et al., 1985), with the exception of Plunkett et al. (2001), who found that Australian youth who self-reported sexual abuse had suicide rates 10–13 times higher than the national Australian rates. Although the literature examining completed adolescent suicide and individual types of maltreatment is sparse, a wealth of research suggests a direct association between both sexual and physical abuse and risk of suicidal behaviors (suicidal thoughts, attempts) in adolescence (Miller, Esposito-Smythers, Weismore, & Renshaw, 2013). Some evidence also suggests a differential importance, with sexual abuse having the most profound effect on adolescent suicidality (Miller et al., 2013). Less is understood about the relationship between emotional abuse or neglect and adolescent suicidal behaviors, with studies showing mixed results (Arata, Langhinrichsen-Rohling, Bowers, & O'Brien, 2007; Dube et al., 2001; Miller et al., 2017). Other than Palmer et al. (2021), we could not identify any population-based studies of suicide risk among adolescents referred to CPS as alleged victims of child maltreatment, nor could we identify any studies that used CPS records to explore maltreatment types and completed adolescent suicide.

In the current retrospective population-based case control study, we examined whether the nature of the alleged maltreatment (i.e., maltreatment type and recency of allegation) and the accompanying system responses (i.e., substantiation, placement) were associated with increased risk of adolescent suicide. Unlike studies that compared children in foster care to children who never experienced maltreatment or CPS contact, we used a “within-group” framework. Specifically, using linked death and CPS records, we defined cases as any adolescent who died by suicide and had a history of at least one allegation of maltreatment and then matched each case to living controls with a history of at least one allegation. We then examined the nature and extent of CPS contact as risk factors for suicide during adolescence.

## 2. Method

An analytic dataset was constructed by linking vital death records maintained by the California Department of Public Health to CPS records under the authority of the California Department of Social Services. Records were accessed for approved research purposes through active data-sharing agreements. Records were probabilistically linked using an open-source software linkage program and an algorithm trained on California data using machine learning methods (ChoiceMaker Technologies, n.d.). Fields used for record linkage included names, dates of birth, social security numbers, and residential address. All direct identifiers were removed prior to analysis; only an anonymized file was accessible to researchers. For this linkage, match recall was 95.04 %, differ recall was 91.32 %, false positives were 1.01 %, and false negatives were 0.94 %. The record linkage and analytic work was reviewed by state and university human subject boards.

### 2.1. Cases

Suicide cases were defined from vital death records based on the International Classification of Diseases (ICD) 10th Revision (World Health Organization, 2004). ICD codes include e-codes to identify the manner (e.g., natural, accidental, suicide, homicide) and mechanism (e.g., suffocation, firearms, poison, jumping) of death. Cases were selected from the full population of Californian decedents who were 15–19 years of age at the time of death between 2010 and 2017 and who had a manner of death coded as suicide (X60-84;  $N = 1,240$ ). Through a probabilistic linkage to CPS records, we determined if a given decedent had ever been reported for alleged abuse or neglect in California ( $n = 579$ ). Due to the years of available data, CPS observations were left censored to 1998, the year in which there was a transition in the state's CPS data system. Youth who had a death coded as suicide but whose only CPS report occurred on or after the suicide event date were excluded ( $n = 64$ ). The final population of cases included 515 adolescents who died by

suicide and had a history of CPS reports.

## 2.2. Controls

Living controls were selected from the population of children with allegations of maltreatment between 1998 and 2017 ( $N = 2,587,082$ ). Using information from the death records, controls were matched to each suicide case based on sex, race and ethnicity, and year of birth (i.e., age), reflecting our attempt to address well-established demographic differences in suicide rates (CDC, 2020). We also matched controls to cases based on age at first maltreatment report to control for the alleged onset of maltreatment and contact with CPS. Matches were completed using Stata version 12.1 and the “joinby” command. After suicide cases were matched to all possible controls, controls were cross-checked with death records to remove any controls who had died during the study period. Each case matched to between nine and 5,450 controls for a total of 772,723 possible controls. Four controls were then randomly selected for each case (Ury, 1975). The final population of controls consisted of 2,060 children who had a history of at least one CPS report and were alive at the time of death of the matched case.

## 2.3. Exposure variables

Exposure variables were derived from the CPS records and captured childhood experiences of maltreatment and CPS contact. These included: (a) a history of allegations of abuse and neglect by maltreatment type (sexual, physical, neglect, and emotional abuse); (b) one or more substantiated allegations; (c) one or more placements in foster care; and (d) years since last CPS contact. Years since last contact was defined as the number of years (rounded to the nearest year) between event age (for suicide cases, equivalent age for living controls) and the age of the most recent of the following four measures of CPS involvement: placement episode associated with a foster care placement; case closure associated with an open case for in-home services; disposition of an open investigation; or the referral receipt date for an allegation of maltreatment that was not investigated. Recency of CPS contact was included to test whether the proximity of maltreatment was related to the outcome.

## 2.4. Analysis

We used Pearson’s chi-square tests to confirm that cases and controls were equivalently matched by sex, race and ethnicity, and year of birth, and  $t$ -tests to confirm equivalency for age at first maltreatment report. Pearson’s chi-square was also used to explore the distribution of cases and controls by level of CPS involvement and maltreatment allegation type, and a  $t$ -test was used to examine differences in years since CPS contact. A conditional logistic regression model was constructed wherein the case-control status (suicide case vs. living control) served as the dependent variable. Given that 79.3 % of all cases and controls had a history of neglect allegations,

**Table 1**

Differences between Cases and Controls across Matched and Exposure Variables, California, United States, 2010–2017.

	Total		Controls		Cases	
	$N = 2575$		$n = 2060$ (80.0 %)		$n = 515$ (20.0 %)	
	$n$	col %	$n$	col %	$n$	col %
<i>Matched variables</i>						
Age at first report ( $M, SD$ )	8.64	5.00	8.64	5.00	8.64	5.00
Gender						
Male	1770	68.7	1416	68.7	354	68.7
Female	805	31.3	644	31.3	161	31.3
Race and ethnicity <sup>a</sup>						
Black	215	8.4	172	8.4	43	8.4
White	1010	39.2	808	39.2	202	39.2
Hispanic	1105	42.9	884	42.9	221	42.9
Asian or Pacific Islander	180	7.0	144	7.0	36	7.0
Year of birth						
1990 to 1994	855	33.2	684	33.2	171	33.2
1995 to 1998	1290	50.1	1032	50.1	258	50.1
1999 to 2002	430	16.7	344	16.7	86	16.7
<i>Exposure variables</i>						
Substantiated allegation*	784	30.5	598	29.0	186	36.1
Foster care placement	297	11.5	226	11.0	71	13.8
Years since last contact ( $M, SD$ )**	5.8	4.6	6.1	4.6	4.5	4.1
Neglect allegation*	2041	79.3	1610	78.2	431	83.7
Emotional abuse allegation	781	30.3	620	30.1	161	31.3
Physical abuse allegation**	1048	40.7	767	37.2	281	54.6
Sexual abuse allegation*	461	17.9	349	16.9	112	21.8

\* $p < .05$ . \*\* $p < .001$ ; for differences between cases and controls, derived from  $\chi^2$  tests.

<sup>a</sup> Racial and ethnic group counts and percentages will not necessarily sum to the total because individuals who were Native American, were other races or ethnicities, or had missing race and ethnicity are not reported due to small cell sizes.

we focused on physical, sexual, and emotional abuse allegations as unique forms of maltreatment exposure in our multivariable model. All other exposure variables were included in the multivariable model. We also tested for interaction effects between sex and sexual abuse. All analyses were completed using Stata version 16.0.

### 3. Results

Between January 1, 2010, and December 31, 2017, in California, 515 suicide deaths were recorded among adolescents aged 15–19 years who had a history of one or more CPS allegations during childhood. The mean age of death among these youth was 17 years. Similar to the statewide breakdown for the general population of youth aged 15–19 years, the most common mechanism of death was suffocation (52.0%), followed by firearms (23.7%), jumping (10.7%), and poison (9.3%; CDC, 2020). Nearly 9% ( $n = 46$ ) of youth in our sample were actively involved with CPS at the time of their death (i.e., had an open child welfare case or an open investigation for maltreatment), with 3.3% ( $n = 17$ ) in out-of-home placement when the death occurred.

Table 1 describes the demographic and CPS characteristics of both cases and controls. More than two-thirds of all decedents were male (68.7%); 42.9% were Hispanic, 39.2% were White, 8.4% were Black, and 7% were Asian or Pacific Islander. The mean age of first CPS report was 8 years. Chi-square and t-tests confirmed that cases and controls were equivalent across all matching variables (i.e., age at first report, sex, race and ethnicity, year of birth;  $p = 1.0$ ). Bivariate comparisons between cases and controls across CPS exposure variables documented several statistically significant differences. Cases were more likely to have had a history of alleged physical abuse (54.6% vs. 37.2%, respectively) and a history of alleged sexual abuse (21.8% vs. 16.9%). In addition, cases were more likely to have been substantiated (36.1% vs. 29.0%) and to have had more recent CPS contact ( $M = 4.5$  years vs. 6.1 years).

In Table 2, we report results from our crude and adjusted conditional logistic regression models. Adolescents who had been reported at least once for physical abuse had suicide odds that were 1.6 times greater than adolescents reported only for other types of maltreatment ( $OR = 1.63$ ; 95% CI = 1.33, 2.01). We tested for interactions between sex and sexual abuse and found that adolescent girls with at least one prior allegation of sexual abuse had 2.7 times greater odds of suicide relative to other girls ( $OR = 2.69$ , 95% CI = 1.58, 4.58). Findings also suggest that the recency of contact with CPS was a significant correlate of adolescent suicide: The odds of suicide declined significantly for every year that had passed since the last report ( $OR = 0.89$ ; 95% CI = 0.86, 0.92). Notably, adolescents with a history of one or more substantiated maltreatment allegations were not significantly more likely to die by suicide than youth who had a history of maltreatment allegations but were never substantiated as a victim. Likewise, no differences in suicide risk were observed between youth placed in foster care and youth who were referred for maltreatment but never removed from home.

### 4. Discussion

As of 2019, the national adolescent suicide rate was 10.5 per 100,000 (CDC, 2020). For youth with a history of CPS contact, the rate was 27.8 per 100,000 (Palmer et al., 2021). Given the disproportionate rates of suicide among these CPS-involved youth, attention is needed on the specific maltreatment experiences or CPS interactions that elevate or reduce risk in this population. In the current study, we used vital death records linked to administrative CPS records to examine suicide risk among adolescents reported for alleged abuse or neglect. Several findings emerged that both extend our understanding of the characteristics of adolescent suicide among CPS-involved youth and highlight areas where further research is needed. First, results of our adjusted model found no statistically significant differences in suicide risk among: (a) youth whose only contact with CPS was an allegation of child maltreatment; (b) adolescents who had a substantiated (or confirmed) allegation of abuse or neglect; and (c) youth who had been placed in foster care. Although it is often assumed that the severity of abuse or neglect is greater for children who are substantiated or placed in foster care, our study produced no evidence that suicide risk varied by level of CPS involvement. This finding aligns with a larger body of research that has similarly failed to identify differences in outcomes based on substantiation (Drake, 1996; Hussey et al., 2005; Kohl, Jonson-Reid, & Drake, 2009; Kugler et al., 2019). Of course, it is also possible that a child's identification as a substantiated victim of maltreatment or placement in foster care may protect against suicide. That is to say, if the severity and chronicity of maltreatment is accurately signaled by more significant responses from CPS, then it is possible that risk may have been offset or buffered by formal CPS interventions offered only to individuals with the designation of substantiation or for whom a foster care placement decision was

**Table 2**

Risk Factors for Completed Suicide among 15- to 19-Year-Olds with a CPS History, California, United States, 2010–2017.

	Bivariate		Multivariable	
	OR	95% CI	OR	95% CI
Substantiated allegation	1.44*	1.16, 1.78	1.19	0.91, 1.55
Foster care placement	1.33	0.99, 1.79	0.90	0.62, 1.29
Years since last contact	0.88**	0.85, 0.91	0.89**	0.86, 0.92
Emotional abuse	1.10	0.89, 1.35	0.77*	0.61, 0.97
Physical abuse	2.00**	1.65, 2.42	1.63**	1.33, 2.01
Sexual abuse (female)	2.42**	1.67, 3.49	2.69**	1.58, 4.58
Sexual abuse (male)	0.85	0.60, 1.23	0.76	0.52, 1.11

\* $p < .05$ . \*\* $p < .001$ ; derived from conditional logistic regression, controlling for sex, year of birth, race and ethnicity, and age of first CPS report. Bivariate and Multivariate  $N = 2,575$ .

made. Additional research is needed to understand whether this nonsignificant finding is related to nondifferential risk or protection against risk.

Second, although an adolescent's designation as a substantiated victim or their history of foster care placements were not tied to suicide risk, our findings suggest that specific experiences of maltreatment are risk factors. Specifically, we found that among adolescents with a history of maltreatment allegations, risk of suicide was significantly heightened for those who were alleged victims of physical or sexual abuse. These findings generally align with the literature (Evans, Hawton, & Rodham, 2005; Miller et al., 2013) and have several clinical implications. Given the higher risk for adolescents experiencing sexual and physical abuse, those with prior exposure should be assessed for current and past suicidal ideation. Likewise, youth who present with suicidal ideation should also be assessed for prior history of abuse. Interestingly, youth with reports of emotional abuse had lower risk of suicide compared to those experiencing other allegation types; however, this may reflect what is being captured in CPS reports of emotional abuse. Given that in California, domestic violence is classified as emotional abuse (California Department of Social Services, 2021), this finding may reflect the effects of domestic violence as a factor in adolescent suicide risk. Additionally, boys with sexual abuse allegations were not statistically different than boys with other allegation types. This appears to be paradoxical to the findings of other research and may reflect the underreporting of sexual abuse among CPS involved boys.

Each of these findings is also notable in the context of our study's null findings related to substantiation and foster care placement. The fact that we detected differences between maltreatment types in a subset of high-risk youth suggests that there may be a hierarchal effect of abuse types, with sexual and physical abuse being important signals of risk. This finding is consistent with other mortality research from California that examined injury fatality risk among young children with a previous allegation of physical abuse (Putnam-Hornstein, Cleves, Licht, & Needell, 2013). Additional research is needed to broaden our understanding of the mechanisms by which sexual and physical abuse are related to suicide risk and the extent to which allegations in administrative records are reliable signals of those childhood exposures.

Finally, youth with more recent contact with CPS had significantly greater odds of suicide. This finding is not entirely surprising. Recent contact may signal the proximity of the abuse or neglect experience, the developmental consequences of which might look quite different for adolescents than for young children (Thornberry, Ireland, & Smith, 2001). Thompson et al. (2012) found that adversity (child abuse, neglect, caregiver instability) between 12–16 years of age was associated with adolescent suicide attempts, while adversity prior to age 12 years was not a predictor of adolescent suicide attempts. However, other studies have found that early childhood exposure to child maltreatment does have detrimental consequences during adolescence or early adulthood. For example, Dunn, McLaughlin, Slopen, Rosand, and Smoller (2013) found that experiencing sexual abuse between ages 3–5 years doubles risk of suicidal ideation, and Khan et al. (2015) found that verbal abuse in early childhood was the strongest predictor of suicidal ideation among young men. Interestingly however, Khan et al. also reported that sexual abuse during late adolescence was the strongest predictor of suicidal ideation among young women. Therefore, more research is needed in understanding the effects of the timing and type of child maltreatment on adolescent suicide. In addition, given the nature of our data and that cases were matched to controls by age of first CPS report, recency of CPS contact may reflect the chronicity of the maltreatment experienced. That is, it may represent the length of time a child or adolescent was exposed to child maltreatment. Chronic and prolonged abuse or neglect, occurring across multiple developmental periods, may have the most deleterious effects on functioning (Jaffee & Maikovich-Fong, 2011). More research is needed to better understand the differing effects of the timing and chronicity of child maltreatment and suicide risk.

Although this study has numerous strengths, including the use of population-based linked data and the ability to rigorously match cases and controls, several limitations should be considered. Due to observations being left censored, early childhood interactions with CPS may not have been included for youth born prior to 1998. However, given that cases were matched to controls based on age at first report and year of birth, this censoring should not have biased our relative estimates. Second, measuring child maltreatment exclusively through administrative CPS records does not allow for the inclusion of children and youth who may have experienced child maltreatment but were never reported. Last, a limited set of exposure variables were available for modeling purposes and did not include known predictors such as parental mental health, substance use, or poverty, therefore, results should be interpreted as documented associations only. The retrospective nature of the study design prevents any causal conclusions. However, by excluding youths whose only contact with CPS was on or later than the date of injury, we can rule out that the outcome preceded the exposure.

Adolescent suicide persists as a major public health concern. Findings from the current study support a growing body of literature that has documented limited differences in outcomes based on substantiation status or foster care placement, reinforcing the importance of not only research, but also family support policies that consider the broader population of children who have been referred to CPS for alleged maltreatment. Further research is needed to deepen our understanding of risk factors in this already vulnerable population, including maltreatment experiences and the extent to which those experiences can be identified using administrative records.

## Declaration of Competing Interest

The authors have no conflicts of interest regarding this work.

## Acknowledgements

This work was supported by the Conrad N. Hilton Foundation, with infrastructure support provided by First 5 LA and the Heising-Simons Foundation. The authors would like to acknowledge and thank collaborators from the USC Children's Data Network and UC Berkeley's California Child Welfare Indicators Project, as well as the California Department of Social Services and county child welfare

departments without whom this work would not be possible. However, the results and conclusions of this study are solely the authors and do not reflect the opinions of any government agency or department.

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