

## Who Is at Risk of Dying Young from Suicide and Sudden Violent Death? Common and Specific Risk Factors among Children, Adolescents, and Young Adults

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*Objective:* Suicides and other sudden violent deaths are the most common causes of death among young people worldwide. This case-control study compared risk factors for suicide and other sudden violent death among young people.

*Method:* A total of 436 psychological autopsy interviews with next of kin were performed. The samples aged 10–25 years included 63 cases of suicide, 62 cases of other sudden violent death, and 104 matched living controls. Two stepwise multiple logistic regression analyses were performed.

*Results:* The number of recent stressful life events was the only common risk factor for suicide and other sudden violent death. Specific risk factors for suicide were any form of addiction and being an inpatient in adult psychiatric care. Specific risk factors for other sudden violent death were lower elementary school results, lower educational level, and abuse of psychoactive drugs.

*Conclusions:* The suicide group seems to have been more vulnerable and exposed to different kinds of stressors, whereas the sudden violent death group seems to have been more acting out and risk-taking. Both groups must be the subject of prevention and intervention programs.

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Nearly one third of the approximately 800,000 people who die worldwide due to suicide every year consist of young people. Suicide is the second leading cause of death among 15–29-year-olds (WHO, 2018), only surpassed by unintentional injury, mostly traffic accidents (Cunningham, Walton, & Carter, 2018; Eurostat, 2019; National Center for Health Statistics, 2019). Sweden's suicide rate (roughly at the same level as the EU average) has fallen by 20% over the past 15 years. However, the suicide rate among children and young adults has remained at the same level (in 2015, it was 10.9 per 100,000 young people between 13 and 24 years of age; Youth Wiki, 2017). These suicide figures are probably an underestimation, as suicide deaths might not be recognized, or may be misclassified as accidents or other causes of death (Bilsen, 2018; Stanistreet, Taylor, Jeffrey, & Gabbay, 2001).

The very low base rate of death by suicide makes it extremely difficult to accurately predict the risk for suicide (Lewinsohn, Rohde, & Seeley, 1994). The difficulties clinicians face in identifying suicidal patients are further exacerbated by the large proportion of depressed patients who do not die of suicide and the high proportion of suicidal ideation among youth (Zametkin, Alter, & Yemini, 2001). The predictive accuracy of instruments aimed at assessment of suicide risk is limited, and they cannot be of clinically practical use (Lindh, 2019). Moreover, "individuals may make a considerable contribution toward their own deaths under circumstances not ordinarily considered suicide" (Litman, Curphey, Shneidman, Farberow, & Tabachnick, 1963, p. 924).

The present study of consecutive cases of nonnatural death among children, adolescents, and young adults might contribute clinically relevant knowledge of risk factors for both suicide and other sudden violent death. We define suicide as "the act of deliberately killing oneself" (WHO, 2014, p. 12), and other forms of sudden violent death as unintentional injury-related death, still being open for underlying, hidden intention to die.

### *Suicide as Cause of Death*

Systematic reviews indicate that the strongest risk factors for youth suicide are current mental disorders and a history of suicidal behavior and psychiatric care (Beautrais, 2000; Bilsen, 2018; Cavanagh, Carson, Sharpe, & Lawrie, 2003; Isometsä, 2001). Independent of mental disorders, negative psychosocial factors, broken homes (separation, divorce, or death of parents), family psychiatric disorder or suicidal behavior, disciplinary problems, antisocial behavior, alcohol or drug misuse, previous self-harm, and adverse life events, such as violence at home, bullying, and sexual abuse, are a common background (Beautrais, 2003; Bilsen, 2018; Cavanagh et al., 2003; Cavanagh, Owens, & Johnstone, 1999; Cheng, Chen, Chen, & Jenkins, 2000; Gould, Fisher, Parides, Flory, & Shaffer, 1996; Hawton & James, 2005; Heikkinen, Aro, & Lönnqvist, 1994; Marttunen, Aro, Henriksson, & Lönnqvist, 1994; Tidemalm et al., 2011). According to the life course model of suicidal behavior, an individual's risk is determined by accumulative exposure to a wide range of risk factors, including social disadvantage, family problems, childhood adversity, personality factors, mental disorders, and exposure to recent stressful life events (Fergusson, Woodward, & Horwood, 2000). The association between stressful life events and death by suicide is well-established, even if there are substantial inconsistencies across studies in the specific nature of interpersonal stressors (Liu & Miller, 2014). Furthermore, research indicates that almost all suicides had experienced adverse life events within one year of death (Foster, 2011), such as loss of health, person, cherished idea, or possession (Cheng et al., 2000), adverse physical health-related events (Cavanagh et al., 2003), interpersonal conflict with parents and with boy/girlfriends, disruption of a romantic attachment, or legal or disciplinary problems (Brent et al., 1993). Additional factors include contagion-imitation and availability of means (Bilsen, 2018).

Looking the other way around, Swedish studies of Child and Adolescent

Psychiatry (CAP) outpatients and inpatients indicated a slightly increased risk of dying from suicide or sudden violent death compared to the average population (de Château, 1990; Nylander, 1979; Rydelius, 1984). A slightly increased suicide risk was also found in patients referred to CAP as emergency cases because of suicide attempts (Engqvist & Rydelius, 2006).

### *Sudden Violent Death*

de la Grandmaison (2006) argued for the need to differentiate between sudden natural unexpected death and violent causes of unexpected death. Sudden violent deaths have traditionally been viewed as either “accidents,” “homicide,” or “suicide.” Major risk factors for sudden violent death among young people include male sex, antisocial personality disorder, criminality, alcohol and drug abuse, adverse family psychosocial characteristics, aggressive feelings and acts, and risk-taking behavior (af Klinteberg, Almquist, Beijer, & Rydelius, 2011; Coffey et al., 2004; Kinner et al., 2015; Repo-Tiihonen, Virkkunen, & Tiihonen, 2001; Stenbacka & Jansson, 2014). Aggressive feelings and acts both against oneself and others, health-compromising behavior, and putting oneself at risk are recurring themes in studies of sudden violent death among youth (de Château, 1990; Mattila et al., 2008; Richardson, Brown, & Van Brakle, 2013; Teplin, McClelland, Abram, & Mileusnic, 2005), thus suggesting that sudden violent death might be regarded as hidden suicide.

### *Hypothesis and Objectives*

The starting point for the present study was the following empirically anchored working hypothesis: A pattern of severe social maladjustment in the home environment, disturbances in identity and personality development, delinquency, mental illness, and specific life events precede both suicide and other sudden violent death among children, adolescents, and young adults, but less frequently occurs in living control cases from

the general population. The assumption is that children growing up in insecure environments show symptoms of acting out as a reaction to their difficult life situation, and these symptoms are comparable to those of depression in other children. Our specific research questions were as follows: Which specific risk factors were common for individuals who died by suicide and violent death, in contrast to living individuals? Which risk factors were unique for the suicide group and for the other sudden violent death group, and were not present in the control group?

## **METHOD**

### *Setting*

Consecutive cases of nonnatural death among children, adolescents, and young adults (up to the age of 25 years) from the Stockholm Region in Sweden were identified at the Department of Forensic Medicine in Stockholm, responsible for all forensic autopsies in the Stockholm County. Information on causes of death was based on autopsy protocols and police reports. Of the 75 consecutive cases of suicide collected over a time period of four years and three months, 63 cases could be included. The collection of 76 consecutive cases of other sudden violent death (murder, accident, unclear accident) took two years, of which 62 cases could be included. To every deceased person, persons of the same age and sex were randomized from the population registry in Stockholm Region. In all, 229 families took part in the study (among the 104 control families the individual young person was included). In nine further cases of suicide and eight cases of sudden violent death, the relatives declined to participate and no further information was collected. In three further cases of suicide and six cases of sudden violent death, the relatives were unreachable by letter and telephone. Thus, in the suicide group the attrition was 12 cases (16%) and in the sudden violent death group, 14 cases (18%).

### *Sample*

Of the 63 cases of suicide, 41 were men (65%) aged 12-25 years ( $M = 21.4$ ;  $SD = 2.5$ ;  $Md = 22$ ) and 22 women (35%) aged 14-24 years ( $M = 19.7$ ;  $SD = 3.3$ ;  $Md = 20.5$ ). Of the 62 cases of sudden violent death, 55 were men (89%) aged 10-25 years ( $M = 20.7$ ;  $SD = 3.7$ ;  $Md = 21$ ) and seven women (11%) aged 17-22 years ( $M = 20.0$ ;  $SD = 1.9$ ;  $Md = 20$ ). The 104 matched control cases included 76 men (73%) aged 10-25 years ( $M = 20.7$ ;  $SD = 3.4$ ;  $Md = 21$ ) and 28 women (27%) aged 14-24 years ( $M = 19.7$ ;  $SD = 3.0$ ;  $Md = 20$ ). For the sociodemographic characteristics of the three samples and descriptive statistics (psychosocial and psychiatric data), see Table 1. Previous suicide attempts, suicide methods, and cause of sudden violent death are presented in Table 2.

### *Interviews*

Basic psychological autopsy procedures were used (Beskow, Runeson, & Åsgård, 1991; Brent, Perper, Kolko, & Zelenak, 1988; Cavanagh et al., 2003; Hawton et al., 1998; Litman et al., 1963). The semi-structured interview protocol covered the following areas: the informant's contacts with the deceased prior to suicide or other violent death, family relationships, the deceased's stressful life events and coping strategies, psychiatric contacts and disorders, previous suicide attempts, and suicidal communication. Open-ended questions allowed the participants to develop their own story. In the control group, the interview protocol was adapted to fit living subjects and their relatives.

The first author conducted tape-recorded interviews, lasting three to four hours per informant, at their home. In the cases of suicide, the interviews were conducted three to 13 months postmortem ( $M = 5.55$ ;  $SD = 1.94$ ;  $Md = 5$ ) and in the cases of other sudden violent death, three to 16 months ( $M = 6.48$ ,  $SD = 2.62$ ;  $Md = 6$ ) postmortem. At least one interview per case

was performed (range 1-4; a total of 436 interviews), preferably with parents of the dead person, and in the control group also with the young persons, but siblings and occasionally other relatives could replace a non-participating parent. Of the 105 interviews in the suicide group, 48 were with the mother, 38 with the father, 13 with a sibling, four with other relatives, and two with a partner. There was one interview in 27 cases, two interviews in 31 cases, three interviews in four cases, and four interviews in one case. In the sudden violent death group, 91 interviews included 49 with the mother, 32 with the father, eight with a sibling, one with another relative, and one with a partner. There was one interview in 35 cases, two interviews in 26 cases, and four interviews in one case. Of the 240 interviews in the control group, 104 were with the subjects, 92 with mothers, and 44 with fathers. There was one interview in one case (the young person only), two interviews (the subject and one parent) in 70 cases, and three interviews (the subject and both parents) in 33 cases.

### *Measures*

The interviews comprised criteria for the following psychiatric diagnoses according to DSM-IV-TR: autistic disorder (AD), attention deficit hyperactivity disorder (ADHD), conduct disorder (CD), oppositional defiant disorder (ODD), depression spectrum disorder (mood disorder, major depressive disorder, or depressive episode), borderline personality disorder (BPD), and antisocial personality disorder (APD). As the criteria for two further DSM-IV autism diagnoses (Asperger syndrome and pervasive developmental disorder) were not included in the interview protocol and only one subject in the sudden violent death group and one in the control group met the AD criteria (in all six subjects), we also checked for broader autism spectrum disorder (ASD) according to DSM-5.

Based on family anamnesis items (severe somatic disease, psychiatric contacts, substance abuse, depression, and suicidality in

**TABLE 1**  
*Sociodemographic, psychosocial and psychiatric data for the three samples*

	Suicide		Sudden violent death		Control cases	
	<i>M</i> (range)	<i>SD</i>	<i>M</i> (range)	<i>SD</i>	<i>M</i> (range)	<i>SD</i>
Age	20.9 (12–25)	3.0	20.6 (10–25)	3.5	20.7 (10–25)	3.4
Mother's age at the child's birth	29.7 (16–42)	5.8	27.1 (17–39)	5.5	28.9 (18–43)	5.2
Father's age at the child's birth	33.0 (19–54)	6.9	29.7 (19–40)	6.0	31.7 (20–49)	6.3
	<i>N</i> = 63	%	<i>N</i> = 62	%	<i>N</i> = 104	%
Gender						
Male	41	65.1	55	88.7	76	73.1
Female	22	34.9	7	11.3	28	26.9
Parents' latest marital status						
Separated or divorced	38	60.3	37	59.7	46	44.2
Married or cohabitant	13	20.6	22	35.5	49	47.1
Dead mother	3	4.8	1	1.6	2	1.9
Dead father	7	11.1	2	3.2	7	6.7
Dead both parents	2	3.2	0	0.0	0	0.0
Latest habitation						
With parent(s)	30	47.6	31	50.0	47	45.2
With partner	7	11.1	8	12.9	22	21.2
With friends	5	7.9	4	6.5	3	2.9
Alone	18	28.6	15	24.2	31	29.8
Psychiatric care	3	4.8	2	3.2	1	1.0
Homeless	0	0.0	2	3.2	0	0.0
Latest marital status						
Single	58	92.1	53	85.5	84	80.8
Cohabitant	5	7.9	9	14.5	19	18.3
Married	0	0.0	0	0.0	1	1.0
Own children( yes)	2	3.2	6	9.7	3	2.9
Stepparents (yes)	20	31.7	10	16.1	35	33.7
Adopted (yes)	1	1.6	2	3.2	4	3.8
Birth order						
Only child	7	11.1	4	6.5	7	6.7
First born	16	25.4	20	32.3	48	46.2
Middle child	16	25.4	18	29.0	20	19.2
Youngest	24	38.1	20	32.3	29	27.9
Country of birth						
Sweden	54	85.7	51	82.3	98	94.2
Other European country	1	1.6	3	4.8	1	1.0
Non-European country	8	12.7	8	12.9	5	4.8
Mother born in Sweden	47	74.6	37	59.7	87	83.7
Mother other European	6	9.5	16	25.8	9	8.7
Mother non-European	10	15.9	9	14.5	8	7.7
Father born in Sweden	42	66.7	39	62.9	88	84.6
Father other European	9	14.3	12	19.4	9	8.7
Father non-European	12	19.0	11	17.7	7	6.7

(continued)

**TABLE 1**  
(continued)

	N = 63	%	N = 62	%	N = 104	%
<b>Education</b>						
Compulsory school or less	33	52.4	38	61.3	27	26.0
Upper secondary school	21	33.3	19	30.6	37	35.6
Post-secondary or university	6	9.5	5	8.1	35	33.7
University degree	3	4.8	0	0.0	5	4.8
<b>Mother's education</b>						
Compulsory school or less	11	17.5	12 <sup>a</sup>	19.7	10	9.6
Upper secondary school	18	28.6	27 <sup>a</sup>	44.3	33	31.7
Post-secondary or university	8	12.7	10 <sup>a</sup>	16.4	12	11.5
University degree	26	41.3	12 <sup>a</sup>	19.7	49	47.1
<b>Father's education</b>						
Compulsory school or less	22	34.9	16 <sup>a</sup>	26.2	19	18.3
Upper secondary school	12	19.0	19 <sup>a</sup>	31.1	28	26.9
Post-secondary or university	6	9.5	6 <sup>a</sup>	9.8	18	17.3
University degree	23	36.5	20 <sup>a</sup>	32.8	39	37.5
<b>Occupation</b>						
Work	19	30.2	22	35.5	40	38.5
Student	14	22.2	19	30.6	39	37.5
Work and student	6	9.5	2	3.2	18	17.3
Sick-listed	9	14.3	2	3.2	1	1.0
Unemployed	15	23.8	17	27.4	6	5.8
<b>Mother's occupation</b>						
Work	57	90.5	52	83.9	99	95.2
Student	0	0.0	0	0.0	1	1.0
Work and student	1	1.6	0	0.0	0	0.0
Sick-listed	1	1.6	7	11.3	2	1.9
Unemployed	2	3.2	0	0.0	1	1.0
Retired	0	0.0	1	1.6	0	0.0
Housewife	2	3.2	2	3.2	1	1.0
<b>Father's occupation</b>						
Work	57 <sup>b</sup>	91.9	56	90.3	103	99.0
Sick-listed	3 <sup>b</sup>	4.8	3	4.8	0	0.0
Unemployed	1 <sup>b</sup>	1.6	2	3.2	1	1.0
Retired	1 <sup>b</sup>	1.6	1	1.6	0	0.0
<b>Criminality</b>						
None	27	42.9	13	21.0	48	46.2
Yes without sanction	18	28.6	13	21.0	40	38.5
Sentenced or investigated	18	28.6	36	58.1	16	15.4
<b>Father's criminality</b>						
None	60	95.2	59	95.2	103	99.0
Sentenced or investigated	3	4.8	3	4.8	1	1.0
<b>Addiction</b>						
None	32	50.8	36	58.1	97	93.3
Alcohol	11	17.5	8	12.9	3	2.9
Substance	20	31.7	21	33.9	5	4.8
Anabolic steroids	6	9.5	9	14.5	0	0.0
Psychoactive drugs	6	9.5	20	32.3	1	1.0
Addiction at the time of death	37 <sup>a</sup>	60.7	26 <sup>a</sup>	42.6		

(continued)

**TABLE 1**  
(continued)

	N = 63	%	N = 62	%	N = 104	%
Mother's addiction						
None	60	95.2	57	91.9	100	96.2
Alcohol	2	3.2	3	4.8	4	3.8
Substance	2	3.2	2	3.2	0	0.0
Psychoactive drugs	0	0.0	2	3.2	0	0.0
Father's addiction						
None	43	68.3	46	74.2	91	87.5
Alcohol	17	27.0	15	24.2	12	11.5
Substance	4	6.3	5	8.1	4	3.8
Psychoactive drugs	0	0.0	1	1.6	0	0.0
Psychiatric care						
None	18	28.6	26	41.9	55	52.9
Outpatient <18 years	28	44.4	30	48.4	42	40.4
Inpatient <18 years	6	9.5	8	12.9	1	1.0
Outpatient >18 years	35	55.6	17	27.4	20	19.2
Inpatient >18 years	25	39.7	11	17.7	2	1.9
Treatment unit youth	9	14.3	12	19.4	2	1.9
Foster-home placement	4	6.3	6	9.7	3	2.9
Mother's psychiatric care						
None	51	81.0	49	79.0	76	73.1
Outpatient >18 years	10	15.9	12	19.4	28	26.9
Inpatient >18 years	2	3.2	1	1.6	2	1.9
Father's psychiatric care						
None	48	76.2	54	87.1	90	86.5
Outpatient >18 years	13	20.6	7	11.3	12	11.5
Inpatient >18 years	4	6.3	2	3.2	5	4.8
Autism spectrum disorder (ASD)	11	17.5	3	4.8	7	6.7
Autistic disorder (AD)	4	6.3	1	1.6	1	1.0
Attention def. hyperactivity dis. (ADHD)	13	20.6	19	30.6	19 <sup>c</sup>	18.4
Conduct disorder (CD)	9	14.3	19	30.6	17 <sup>c</sup>	16.5
Oppositional defiant disorder (ODD)	13	20.6	12	19.4	15 <sup>c</sup>	14.6
Borderline personality disorder (BPD)	25 <sup>d</sup>	43.9	21 <sup>e</sup>	40.4	5 <sup>f</sup>	5.8
Depression spectrum disorder	42	66.7	22	35.5	40 <sup>c</sup>	38.8
Antisocial personality disorder (APD)	7 <sup>d</sup>	12.3	19 <sup>e</sup>	36.5	4 <sup>f</sup>	4.7
Being bullied	28	44.4	15	24.2	54	51.9
Being sexually assaulted	13	20.6	1	1.6	4	3.8
Suicide attempt among relatives	20	31.7	18	29.0	38	36.5
Death by suicide among relatives	22	34.9	11	17.7	30	28.8

<sup>a</sup>N = 61 owing to missing data.

<sup>b</sup>N = 62 owing to missing data.

<sup>c</sup>N = 103 due to missing data.

<sup>d</sup>N = 57 age > 18 years.

<sup>e</sup>N = 52 age > 18 years.

<sup>f</sup>N = 86 age > 18 years.

the family), we created a *Family Dysfunction Index* (number of “yes” answers ranging from 0 to 8). Another included index was number

of family problems during the subject’s childhood and adolescence (number of “yes” answers ranging from 0 to 10).

**TABLE 2**  
*Suicide attempts, suicide methods, and cause of sudden violent death*

Suicide	Women		Men		Total	
	N = 22	%	N = 41	%	N = 63	%
No previous attempt	10	45.5	21	51.2	31	49.2
Single suicide attempt	6	27.3	11	26.8	17	27.0
Multiple attempts	6	27.3	9	22.0	15	23.8
Physical methods	17	77.3	34	82.9	51	81.0
Hanging	8	36.4	11	26.8	19	30.2
Railway tracks	4	18.2	9	22.0	13	20.6
Drowning	3	13.6	0	0.0	3	4.8
Jumping	1	4.5	7	17.1	8	12.7
Firearms	1	4.5	3	7.3	4	6.3
Knife	0	0.0	2	4.9	2	3.2
Suffocation	0	0.0	1	2.4	1	1.6
Single-car crash	0	0.0	1	2.4	1	1.6
Chemical methods	5	22.7	7	17.1	12	19.0
Medication	4	18.2	4	9.8	8	12.7
Drug overdose	1	4.5	2	4.9	3	4.8
Gas	0	0.0	1	2.4	1	1.6

  

Sudden violent death	Women		Men		Total	
	N = 7	%	N = 55	%	N = 62	%
No previous attempt	7	100.0	49	89.1	56	90.3
Single suicide attempt	0	0.0	3	5.5	3	4.8
Multiple attempts	0	0.0	3	5.5	3	4.8
Homicide	2	28.6	5	9.1	7	11.3
Traffic accident	3	42.9	22	40.0	25	40.3
Fire	1	14.3	2	3.6	3	4.8
Drowning	0	0.0	2	3.6	2	3.2
Work accident	0	0.0	2	3.6	2	3.2
Medication	1	14.3	10	18.2	11	17.7
Overdose	0	0.0	11	20.0	11	17.7
Fire arms accident	0	0.0	1	1.8	1	1.6

  

Control group	Women		Men		Total	
	N = 28	%	N = 76	%	N = 104	%
No suicide attempt	23	82.1	73	96.1	96	92.3
Single suicide attempt	4	14.3	3	3.9	7	6.7
Multiple attempts	1	3.6	0	0.0	1	1.0

*Adverse Childhood Experiences* (ACEs; Felitti et al., 1998) were measured following the 10-category classification applied in most recent ACE studies (ACEs Science 101, 2019; Dube et al., 2003): abuse variables (emotional and verbal abuse, physical abuse, sexual

abuse), neglect variables (emotional neglect, physical neglect), and household dysfunction variables (battered mother [witnessing a mother being abused], household substance abuse, mental illness or depression in household, parental separation or divorce,



incarcerated [imprisoned] household member). For each case, all ACEs were coded as “no” or “yes,” based on the total available interview material. Such a procedure risks underestimating ACEs; however, this risk should have been the same in the three groups.

Stressful life events in the previous year were assessed using all relevant interview information and scored following a modified nonadult version of the Holmes and Rahe *Social Readjustment Rating Scale* (SRRS; Holmes & Rahe, 1967). The nonadult version is based on the *Adolescent Life Change Event Scale* (ALCES; Yeaworth, McNamee, & Pozehl, 1992) and is available online. To the original 39 SRRS items, we added the following age-relevant items: imprisonment, exposed to violence, moving away from home, increase in arguments with parents or partner, economic difficulties, and starting or interrupting work or studies. Each of the 45 items was ascribed a Life Change Unit (LCU; Rahe & Arthur, 1978) on a 100-point scale. The *Social Readjustment Index* (SRI) is the sum of all LCU scores. We also calculated the *Life Event Index* (LEI; Blasco-Fontecilla et al. (2012), which is simply the total number of stressful life events for each case.

#### *Data Analysis*

Following the procedure of psychological autopsy, we used multiple informants, when possible, for each case included in the analyses. For each quantitative interview item, the answers were weighed by the first author, striving to cover the maximal amount of relevant information. Thus, the analysis units were cases in the three groups, and not the informants. Statistical analyses are based on all collected quantitative data, and the 54 relevant variables are included in a predictor analysis. In all analyses, the dependent variable is nominal and tripartite: suicide, other sudden violent death, and control cases. To facilitate the identification of potential predictors for the final analysis, the univariate effects of the potential risk factors on the dependent variable were tested separately for

cases of suicide–control cases and cases of sudden violent death–control cases, using logistic regression. To correct for the number of contrasts, the alpha level of each comparison was set at  $p < .025$ . As the three groups had analogous age distribution (Table 1) and there were no significant between-group age differences, age was not controlled for. As a last step, two stepwise multiple logistic regression analyses were performed to identify unique predictors of suicide and other sudden violent death. Variables showing significant between-group differences in the previous analyses were included as independent variables, and those contributing to an improved predictive capacity, as indicated by a decrease in the Akaike information criterion (AIC) and having a significant unique association with the outcome, were retained in the final model. Analyses were conducted with R 3.5.2 statistical software (R Core Team, 2018) employing the *lmtree* package (Zeileis & Hothorn, 2002).

#### *Ethical Research Compliance*

The project was approved by the Regional Ethical Review Board, Karolinska Institutet, Stockholm (reference number 96:204 and 2005/530-32), and all informants (parents and relatives of the deceased, as well as all participants in the control group and their parents) gave informed consent.

## RESULTS

#### *Univariate Effects*

We found 18 significant differences between the suicide group and the control group and 22 significant differences between the sudden violent death group and the control group. Twelve of these potential risk factors were common for the suicide and sudden violent death groups, as compared to the control group, whereas six risk factors were unique for suicide and ten for sudden violent death (Table 3). In the case of dummy variables, significant results are reported below

**TABLE 3**  
*Univariate effects of the potential risk factors on the dependent variable*

Variable	Suicide vs. control cases			Sudden violent death vs. control cases		
	OR	95% CI	<i>p</i> -value	OR	95% CI	<i>p</i> -value
Gender (female)	1.456	0.741 2.861	.275	0.345	0.141 0.848	.020
Mother's age at the child's birth	1.024	0.967 1.085	.414	0.936	0.880 0.995	.035
Elementary school results <sup>a</sup>			.081			.000
Results above average	0.667	0.327 1.358	.264	0.175	0.078 0.390	.000
Results below average	0.667	0.198 2.244	.513	1.174	0.445 3.097	.746
Missing grades from elementary school	6.667	0.724 61.405	.094	5.419	0.614 47.801	.128
Upper secondary school, average or higher grades	0.209	0.097 0.450	.000	0.182	0.084 0.394	.000
Education level <sup>b</sup>			.000			.000
Upper secondary school	0.464	0.222 0.972	.042	0.365	0.174 0.766	.008
Postsecondary or university	0.140	0.051 0.383	.000	0.102	0.035 0.293	.000
University degree	0.491	0.107 2.242	.359	0.000	0.000 NA	.987
Mother's educational level <sup>b</sup>			.507			.003
Upper secondary school	0.496	0.177 1.391	.182	0.682	0.256 1.819	.444
Postsecondary or university	0.606	0.176 2.091	.428	0.694	0.212 2.275	.547
University degree	0.482	0.181 1.285	.145	0.204	0.071 0.583	.003
Father's educational level <sup>b</sup>			.069			.367
Upper secondary school	0.370	0.148 0.923	.033	0.806	0.333 1.951	.632
Postsecondary or university	0.288	0.095 0.873	.028	0.396	0.127 1.236	.111
University degree	0.509	0.229 1.135	.099	0.609	0.259 1.433	.256
Occupation (studies or work; no-yes)	0.126	0.050 0.316	.000	0.163	0.064 0.417	.000
Steady relationship at death or at interview	0.458	0.235 0.896	.022	1.485	0.788 2.800	.221
Addiction (no-yes)	13.424	5.391 33.428	.000	10.008	3.996 25.065	.000
Alcohol abuse	7.122	1.903 26.653	.004	4.988	1.271 19.578	.021
Substance abuse	9.209	3.244 26.142	.000	10.141	3.581 28.722	.000
Abuse of anabolic steroids	NA	0.000 NA	.986	NA	0.000 NA	.983
Abuse of psychoactive drugs	10.842	1.274 92.302	.029	49.048	6.377 377.227	.000
Alcohol or drugs at the time of death	NA	0.000 NA	.985	NA	0.000 NA	.988
Mother's addiction (no-yes)	1.250	0.270 5.777	.775	2.193	0.566 8.497	.256
Father's addiction (no-yes)	3.256	1.482 7.151	.003	2.435	1.080 5.491	.032
Father's substance abuse	1.695	0.409 7.032	.467	2.193	0.566 8.497	.256
Investigated or sentenced for criminal acts	2.143	0.982 4.680	.056	8.031	3.813 16.913	.000
Father's criminality	5.150	0.524 50.627	.160	5.237	0.533 51.497	.156
Psychiatric care (no-yes)	2.806	1.438 5.476	.002	1.554	0.824 2.932	.173
Outpatient child and adolescent psychiatry	1.181	0.627 2.224	.606	1.384	0.734 2.608	.315
Inpatient child and adolescent psychiatry	10.842	1.274 92.302	.029	15.259	1.860 125.205	.011

(continued)

**TABLE 3**  
(continued)

Variable	Suicide vs. control cases			Sudden violent death vs. control cases		
	OR	95% CI	<i>p</i> -value	OR	95% CI	<i>p</i> -value
Outpatient adult psychiatric care	5.250	2.617 10.533	.000	1.587	0.756 3.329	.222
Inpatient adult psychiatric care	33.553	7.579 148.533	.000	11.000	2.349 51.501	.002
Admission to treatment unit for young people	8.417	1.756 40.352	.008	12.120	2.612 56.245	.001
Mother's psychiatric care (no–yes)	0.639	0.298 1.371	.250	0.720	0.340 1.524	.390
Mother's outpatient psychiatric care	0.512	0.229 1.143	.102	0.651	0.303 1.399	.272
Mother's inpatient psychiatric care	1.672	0.230 12.178	.612	0.836	0.074 9.415	.885
Father's psychiatric care (no–yes)	2.009	0.895 4.508	.091	0.952	0.375 2.418	.918
Father's outpatient psychiatric care	1.993	0.846 4.696	.115	0.976	0.362 2.627	.961
Father's inpatient psychiatric care	1.342	0.347 5.198	.670	0.660	0.124 3.509	.626
Autism spectrum disorder (ASD)	2.931	1.072 8.014	.036	0.717	0.178 2.881	.639
Autistic disorder (AD)	6.983	0.763 63.948	.085	1.717	0.105 27.951	.704
Attention deficit hyperactivity disorder (ADHD)	1.149	0.523 2.527	.729	1.953	0.937 4.072	.074
Conduct disorder (CD)	0.843	0.351 2.026	.703	2.235	1.056 4.731	.035
Oppositional defiant disorder (ODD)	1.525	0.672 3.463	.313	1.408	0.611 3.244	.422
Borderline personality disorder (BPD)	12.656	4.457 35.943	.000	10.974	3.804 31.661	.000
Depression spectrum disorder	3.150	1.633 6.075	.001	0.866	0.450 1.666	.667
Antisocial personality disorder (APD)	2.870	0.800 10.300	.106	11.803	3.732 37.331	.000
Divorced or separated parents	1.917	1.015 3.620	.045	1.866	0.986 3.532	.055
Dead parent <sup>c</sup>			.099			.597
Dead mother	1.863	0.619 5.605	.268	0.460	0.092 2.289	.343
Dead father	2.794	0.452 17.267	.269	0.805	0.071 9.075	.861
Dead both parents	NA	0.000 NA	.987			
Number of family problems	0.979	0.827 1.160	.810	0.887	0.746 1.055	.175
Adverse childhood experiences (ACE)	1.879	1.430 2.470	.000	1.569	1.198 2.054	.001
Being bullied	0.741	0.395 1.389	.349	0.296	0.147 0.593	.001
Being sexually assaulted	6.500	2.015 20.963	.002	0.424	0.046 3.881	.447
Family Dysfunction Index	0.917	0.778 1.081	.302	0.750	0.629 0.893	.001
Suicide attempt among relatives	0.808	0.416 1.569	.529	0.727	0.368 1.435	.358

(continued)

**TABLE 3**  
(continued)

Variable	Suicide vs. control cases			Sudden violent death vs. control cases		
	OR	95% CI	<i>p</i> -value	OR	95% CI	<i>p</i> -value
Death by suicide among relatives	1.324	0.678 2.585	.412	0.543	0.249 1.182	.124
Foster-home placement	2.282	0.494 10.552	.291	3.607	0.869 14.981	.077
Stressful life events previous year (no–yes)	6.000	0.742 48.543	.093	0.570	0.213 1.524	.263
Severity of stressful life events (SRI)	1.019	1.012 1.026	.000	1.009	1.004 1.015	.001
Number of stressful life events (LED)	3.052	2.120 4.394	.000	1.724	1.278 2.325	.000
Recent death close to the young person	1.767	0.873 3.577	.114	0.765	0.401 1.457	.415

NA, not available due to too low frequency in at least one of the groups.

<sup>a</sup>Reference category “average results”.

<sup>b</sup>Reference category “elementary school or less”.

<sup>c</sup>Reference category “none”.

only if there also are significant between-group differences on the single independent variable.

Both the suicide group and the sudden violent death group had significantly lower upper secondary school results than the general population controls, lower attained educational level, and were less likely to have had a meaningful occupation. Alcohol and substance abuse were associated with both causes of death, but abuse of psychoactive drugs was distinguishing for cases of sudden violent death. Among CAP inpatients, the odds of belonging to the sudden violent death group were twelve times higher than belonging to the control group, whereas the odds of belonging to the suicide group were five times higher among adult psychiatric outpatients. Both groups had higher odds than the controls of admission to inpatient adult psychiatric care and to a treatment unit for young people with substance abuse or criminality. Furthermore, higher odds of belonging to the suicide and the sudden violent death groups were associated with having been exposed to

adverse childhood experiences and to recent stressful life events.

Borderline personality disorder was associated with both causes of death; depression spectrum disorder was associated with death by suicide, whereas antisocial personality disorder was associated with sudden violent death. Accordingly, being investigated or sentenced for criminal acts was more common among cases of sudden violent death than among the controls. Noticeably, being bullied was negatively associated with belonging to the sudden violent death group, whereas being sexually assaulted was positively associated with belonging to the suicide group in comparison with the controls. Paradoxically, Family Dysfunction Index was associated with lower odds of dying a sudden violent death rather than belonging to the controls.

In comparison with the control cases, distinguishing risk factors for suicide included father’s addiction, having contact with psychiatric care, being a psychiatric outpatient, having depression, and having been sexually

assaulted. Being in a steady relationship was negatively associated with belonging to the suicide group, thus constituting a potential protective factor against suicide. Distinguishing risk factors for sudden violent death included being a man, being investigated or sentenced, and having antisocial personality disorder. Furthermore, we found negative associations between belonging to the sudden violent death group and having elementary school results above average, having upper secondary school education, and the mother having a university degree.

*Multivariate Effects*

The multiple logistic regression analyses showed three significant differences between the suicide group and controls, and seven significant differences between sudden

violent death group and the controls (Table 4). The multivariate models could explain a large proportion of the variance in the odds of belonging to the different groups ( $R^2 = .528$  and  $.644$ , respectively).

Adjusting for the other predictors, we found significant positive associations between being in the suicide group, rather than the control group, and addiction (4.8 times higher odds), inpatient adult psychiatric care (11.2 times higher odds), and number of stressful life events in the previous year (2.1 times higher odds for each increase on the scale by one). Belonging to the sudden violent death group, rather than the control group, was positively associated with abuse of psychoactive drugs (47.8 times higher odds) and number of recent stressful life events (1.7 times higher odds for each increase on the scale by one). Furthermore, we found

**TABLE 4**  
*Multivariate effects of the potential risk factors on the dependent variable*

Variable	Suicide vs. control cases ( $R^2 = .528$ ) <sup>a</sup>			
	OR	95% CI		p-value
Addiction (no–yes)	4.790	1.684	13.620	.003
Inpatient adult psychiatric care	11.164	2.329	53.513	.003
Number of stressful life events (LEI)	2.089	1.418	3.077	.000
Variable	Sudden violent death vs. control cases ( $R^2 = .644$ ) <sup>a</sup>			
	OR	95% CI		p-value
Elementary school results <sup>b</sup>				.001
Results above average	0.150	0.048	0.465	.001
Results below average	1.156	0.293	4.556	.836
Missing grades from elementary school	0.997	0.077	12.944	.998
Education level <sup>c</sup>				.000
Upper secondary school	0.252	0.082	0.770	.016
Postsecondary or university	0.077	0.018	0.323	.000
University degree	0.000	0.000	NA	.992
Abuse of psychoactive drugs	47.751	4.153	549.034	.002
Family Dysfunction Index	0.676	0.517	0.886	.004
Being bullied	0.135	0.043	0.421	.001
Number of stressful life events (LEI)	1.653	1.077	2.536	.021

NA, not available due to too low frequency in at least one of the groups.

<sup>a</sup>Nagelkerke R square.

<sup>b</sup>Reference category “average results”.

<sup>c</sup>Reference category “elementary school or less”.

negative associations with having elementary school results above average (85% lower odds) and the educational level (75% lower odds of upper secondary level; 92% lower odds of postsecondary level or university studies). Surprisingly, comparing to the controls, the sudden violent death group also had a lower Family Dysfunction Index (32% lower odds for each increase on the scale by one) and lower odds of being bullied (87%).

## DISCUSSION

Looking at the sociodemographic data (Table 1), we found twice as many males as females in the suicide group and eight times as many males as females in the other sudden violent death group. In most Western countries, women have higher rates of suicide attempts, but lower rates of death by suicide than men (Payne, Svami, & Stanistreet, 2008). In our study, the gender difference was even more marked in the case of sudden violent death. According to Stillion and Noviello (2001), factors that contribute to the higher violent death rate for US males include an inherited tendency toward aggression, socialization practices that endorse violence, and an environment that models and supports violence for males.

About half of those who died by suicide had previously attempted suicide, and almost a quarter of those who died by suicide had previously made multiple suicide attempts (Table 2). On the other hand, almost half of the young persons had no previous suicide attempts. None of the females and only 11% of the males had attempted suicide in the sudden violent death group. A Swedish study of the risk of premature death among former CAP patients (Engqvist & Rydelius, 2006) indicated that problems in school, behavioral symptoms, and conduct symptoms were more important in the calculation of risk of early death or suicide than suicide attempts. Violent physical suicide methods were more common than poisoning among both sexes. Accordingly, no significant gender difference in suicide method was found in a Danish

sample (Nordentoft & Branner, 2008). Hanging was the most common suicide method among both sexes in our study and is also the most prevalent method in Europe (Värnik et al., 2008), in contrast to United States, where the use of firearms is the most common method of suicide for both men and women (Callanan & Davis, 2012). Traffic accidents were the most common cause of sudden violent death for both sexes (the first leading cause of death among young people in both the United States and Europe; Cunningham et al., 2018; Eurostat, 2019; National Center for Health Statistics, 2019), followed by abuse of psychoactive drugs and overdose among men.

Comparing the risk factors for suicide and other sudden violent death, identified in the univariate analysis, we found both similarities and differences (Table 3). Common risk factors, in comparison with the controls, covered such areas as education and occupation, addiction, psychiatric care, and early and late adversities in life. Differences between suicide and sudden violent death included gender, partner relationship, abuse of psychoactive drugs, father's addiction, problems with justice, and somewhat different patterns of school outcomes, victimization, psychiatric care, and mental disorders (commented below). Living in a steady relationship seemed to be a protective factor against suicide, whereas being a man was a risk factor for sudden violent death.

Analysis of multivariate effects of the potential risk factors (Table 4) indicated that the number of stressful life events in the previous year was the only common risk factor for both suicide and other sudden violent death. Risk factors for suicide included addiction and being an inpatient in adult psychiatric care. Risk factors for sudden violent death included having lower elementary school results, lower education level, and abuse of psychoactive drugs. The negative association between being bullied and sudden violent death might be interpreted as a consequence of the subjects showing acting out and aggressive tendencies rather than being victims. On the other hand, the lower Family

Dysfunction Index in this group is hard to interpret.

Our results suggest that substance abuse has a different meaning in cases of suicide and other sudden violent death. We found addiction to be more common in cases of suicide than in the controls, whereas abuse of psychoactive drugs was a distinguishing factor for other sudden violent death. Being in adult inpatient psychiatric care increased the odds of belonging to the suicide group, thus indicating more severe or acute mental problems, but also the need of including risk assessment and preventive measures into routine clinical care, not just in emergency units (Schaffer et al., 2016). Accordingly, a Finnish survey (Pirkola, Sund, Sailas, & Wahlbeck, 2009) concluded that well-developed community mental health services are more strongly associated with lower suicide rates than are services oriented toward inpatient treatment provision.

Looking at the multivariate effects, none of the psychiatric diagnoses were associated with higher odds of belonging to the suicide or the sudden violent death group rather than the control group. This confirms that the complex interplay between psychosocial risk factors has a decisive influence on both causes of death, beyond diagnostic categories (cf., Foster, 2011; Gould et al., 1996). On the other hand, systematic reviews found current mental disorder and previous psychiatric care to be the strongest risk factors for youth suicide (Beautrais, 2000; Cavanagh et al., 2003; Isometsä, 2001). On the univariate level, borderline personality disorder was associated with both causes of death; depression was associated with death by suicide, whereas antisocial personality disorder was associated with sudden violent death. Studies show that up to 10% of patients with BPD die by suicide (Skodol et al., 2002). The association between BPD (emotionally unstable personality disorder according to ICD-10) and suicide was previously found, for example, in Canada (Lesage et al., 1994) and Taiwan (Cheng et al., 2000). In a Swedish study, persons with BPD constituted one third of the total sample of suicides in adolescents and young adults

(Runeson & Beskow, 1991). Previously, high ratios of both borderline and antisocial personality disorders were found among young Swedish people who died by suicide and other forms of sudden violent death (Rydellius, 1984, 1988). Antisocial personality disorder has been shown to covary with BPD (Moran, 1999). In our study, both these personality disorders were common in the sudden violent death group. The association between antisocial personality disorder and sudden violent death is consistent with previous research (Coffey et al., 2004; Repo-Tiihonen et al., 2001). Similar to previous research (Bourdet-Loubère, & Raynaud, 2013; Brent, Perper, Goldstein, et al., 1988; Cheng et al., 2000; Eapen & Crnec, 2012; Runeson, 1989; Williams, O'Connor, Eder, & Whitlock, 2009), we found an association between depression and suicide. Depression spectrum disorder was the largest diagnostic category in the suicide group (67% of cases), thus indicating that depression covaries with many other risk factors for suicide (Berman, Jobs, & Silverman, 2006; Lewinsohn et al., 1994).

Besides mental disorders, some of the other well-documented risk factors emerged in the present study only on the univariate level, such as adverse childhood experiences (both suicide and sudden violent death), being sexually assaulted (suicides), and severity of stressful life events in the previous year (both groups). Previous research indicated that independently of other psychosocial and psychiatric factors, early and late life adversities, and particularly accumulated adversities, are a risk factor for suicidal behavior (Björkenstam, Kosidou, & Björkenstam, 2017; Fergusson et al., 2000; Foster, 2011; Joiner et al., 2007; Liu & Miller, 2014; Read, Agar, Barker-Collo, Davies, & Moskowitz, 2001; Séguin, Renaud, Lesage, Robert, & Turecki, 2011). However, a new finding is the importance of adverse life events as a risk factor for sudden violent death.

Strikingly, some potential psychosocial and psychiatric risk factors were not associated with death by suicide or sudden violent death, even on the univariate level (e.g., having a younger mother, foster-home

placement, having divorced or separated parents, death of a parent, recent death among relatives or friends, mother's addiction, father's lower education level, father's criminality, suicide or suicide attempts among relatives, parents' psychiatric care, having ADHD, conduct disorder, or oppositional defiant disorder).

To sum up, the suicide group seems to have been more vulnerable and exposed to different kinds of stressors, whereas the sudden violent death group seems to have been more acting out and risk-taking. Two different ways of coping with adversities and strains in life are conceptually linked to internalizing disorders (depression, anxiety disorder, phobic, panic, and obsessive-compulsive) and externalizing disorders (antisocial personality, substance dependence), both playing a part in suicide attempts. At least two subtypes of individuals with suicidal behavior have been found in previous studies (Apter et al., 1991, 1995): depressed/withdrawn, and irritable/aggressive. Suicidal behavior among individuals with externalizing symptoms is not necessarily a result of comorbid depressive or other internalizing disorder; instead, it might be associated with impulsive and anger-related behaviors (Verona, Sachs-Ericsson, & Joiner, 2004). Impulsive-aggressive traits play a greater role in completed suicide among younger individuals than among older ones (McGirr et al., 2008). In our study, we found associations between internalizing psychopathology and suicide (depression spectrum disorders), and between externalizing psychopathology and sudden violent death (antisocial personality disorder). However, addiction (externalizing) and BPD (mixed internalizing and externalizing psychopathology; Verona et al., 2004) were associated with both causes of death. Thus, we can speculate that mixed psychopathology represents what is common for suicide and sudden violent death, whereas a predominance of internalizing psychopathology represents what is specific for cases of suicide, and a predominance of externalizing psychopathology represents what is specific for cases of sudden violent death. It is possible that these differences are

connected with differences in coping strategies between the two groups (further explored in a coming study). As stated by Portes, Sandhu, and Longwell-Grice (2002, p. 805), "Some adolescents internalize rejection and respond with suicide; other troubled adolescents engage in homicide before ending their own lives." We could add to this that still others externalize rejection and die a sudden violent death.

#### *Strengths and Limitations*

The main assets of the present study are the prospective design and the inclusion of both cases of death by suicide and sudden violent death, as well as matched living control cases from the general population. To our knowledge, no other case-control study that compares risk factors for the two causes of death among young people has been published to date. Furthermore, the study is based on a prospective collection of consecutive cases in the two groups of death with relatively high response rates (82%–84%), contributing to the high representativity of our results. This has to be compared with the usual response rate of 50%–60% for psychological autopsy studies (Hawton et al., 1998). The use of multiple informants minimized the risk of over- or under-reporting bias. On the other side, the procedure of weighing the informants' answers inevitably involves a risk of subjective judgments. Another potential source of error is the relatively high proportion of single informants. Relatively high rates of psychopathology in the control group were observed, however, reflecting what is known about the Swedish population of young people, especially in the metropolitan area of Stockholm. The proportion of Swedish 13- and 15-year-old youths reporting psychological and somatic ill health has doubled the last three decades, and nowadays, more than 62% of the 15-year-old girls and 35% of the boys reported multiple psychosomatic health complaints. In a national public health survey, every third woman and every fifth man in the age group 16–29 years report reduced mental well-being in 2018



(Folkhälsomyndigheten, 2019). Additionally, an increased occurrence of ADHD diagnoses has been noticed, may be partly due to the diagnosis being a precondition for supportive measures in Swedish schools (Polyzoi, Ahnemark, Medin, & Ginsberg, 2018; Rydell, Lundström, Gillberg, Lichtenstein, & Larsson, 2018).

### *Conclusions and Implications*

Most of the psychological models of suicide focus either on vulnerability factors and coping deficits or on the situational perceived stress (Barzilay & Apter, 2014). Our study suggests a dynamic interplay between adverse childhood experiences, connected with vulnerability factors, current strains in life, help-seeking behavior (including contacts with psychiatric ward), and coping strategies. This interplay seems to have some common features, but also important differences when comparing cases of suicide and cases of sudden violent death. A synthesis of findings from psychological autopsy studies (Foster, 2011) confirmed that inadequate problem-solving skills increase suicide risk. However, we still lack studies comparing internalizing and externalizing coping in cases of suicide and of sudden violent death among men and women separately.

In conclusion, the pattern of psychosocial factors, developmental disturbances, and strains in life was partly similar, partly different in cases of suicide and of sudden violent death, but for both groups was significantly different from the control cases. This can pose a serious challenge to professionals and providers of health and social services. What was not included in the variables explored

here but clearly surfaced from the interviews were risk factors linked to the contacts with school counselors, social authorities, CAP and adult psychiatry and other professionals (Werbart Törnblom, Werbart, & Rydelius, 2015). In the suicide group, parents typically did not see health professionals as an asset during a crisis, perceiving them as too impersonal and preoccupied, understanding neither the emergency nor the underlying problems. In the sudden violent death group, barriers to seeking help were even larger and the professionals seemed not to understand the psychic pain behind antisocial behavior, addiction, or delinquency. Consequently, there is an urgent need for in-depth research into the mechanisms of destructive and self-destructive behavior, bridging the gap between empirical studies and clinical and social practice. Cunningham et al. (2018) made a case for a shift in public perception of injury deaths in children and adolescents from being viewed as “accidents” to being regarded as social ecologic phenomena and as preventable. Not only suicide, but also other sudden violent death in youths must be the subject of prevention and intervention programs. Focusing on adverse childhood experiences (Dube et al., 2001), as well as targeting thwarted belongingness and perceived burdensomeness (Ribeiro, Bodell, Hames, Hagan, & Joiner, 2013), can constitute a common ground. The greatest challenge for the society is to take adequate action to assist those who never dare to seek professional help before dying by suicide or sudden violent death (29% and 42%, respectively, in our study).

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