



Research paper

Sociodemographic and clinical characteristics of suicide methods in Denmark: A nationwide registry-based study of suicides during 2010–2020

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ARTICLE INFO

Keywords:

Suicide
Methods
Clinical characteristics
Sociodemographic factors
Occupations
Denmark

ABSTRACT

Background: Suicide mortality is influenced by the lethality of the method used, making it essential for effective suicide prevention. This nationwide study examined whether suicide methods differ by sociodemographic and clinical characteristics among individuals who died by suicide in Denmark.

Methods: We conducted a retrospective register-based cohort study including all suicide decedents in Denmark between 2010 and 2020 ($n = 6257$). Data were obtained from Danish national health registers. Multinomial logistic regression examined associations between individual characteristics and suicide methods, using hanging as the reference category. Statistical significance was assessed with Holm-Bonferroni-adjusted p -values.

Results: Compared with hanging, self-poisoning with drugs was significantly associated with female sex (male: OR = 0.37, 95%CI [0.31–0.44]), psychotropic drug treatment (OR = 1.61, 95%CI [1.25–2.07]), and previous suicide attempts (OR = 1.46, 95%CI [1.22–1.73]). Self-poisoning with other substances was more common among individuals without known health conditions. Firearms were significantly associated with male sex (OR = 10.11, 95%CI [5.58–18.32]), and absence of psychiatric history (OR = 0.42, 95%CI [0.27–0.64]). Suicide by jumping was significantly associated with recent psychiatric admissions (OR = 2.52, 95%CI [1.87–3.40]), psychotic disorders (OR = 1.69, 95%CI [1.25–2.27]) and OCD (OR = 3.65, 95%CI [1.71–7.76]). Hanging was the most used method among individuals with a history of affective disorders.

Conclusions: Suicide methods were associated with distinct sociodemographic and clinical characteristics, indicating heterogeneity in method-specific profiles. Individuals using less lethal methods were more likely to have previous healthcare contact, indicating opportunities for targeted prevention, whereas violent methods appeared more strongly related to access to means and non-help-seeking. These findings support method-specific suicide risk assessment and prevention strategies.

1. Introduction

Suicide prevention is an important public health priority in Denmark and across the world, as suicide continues to be one of the leading causes of death globally, taking the lives of more than 700,000 people each year (World Health Organization, 2021). Despite its complex and persistent nature, suicide is preventable and can be significantly reduced. One of the most effective strategies for suicide prevention is restricting access to methods used in suicidal acts (Mann et al., 2021; Zalsman et al., 2016). This includes regulation on pesticides, medication, and poisons,

restrictions on firearms access, and the installation of barriers at railways, buildings, bridges, and other hot spots. This approach is based on the understanding that suicidal crises are often impulsive and fleeting (Rimkeviciene et al., 2015). Effectively implementing methods restriction requires a nuanced understanding of suicide patterns at both global and national levels, and identification of method-specific risk factors.

Suicide methods vary across countries. Globally, the most common are hanging, pesticide poisoning, and firearms (World Health Organization and Food and Agriculture Organization of the United Nations, 2019). Firearms predominate in the US (Choi et al., 2022;

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<https://doi.org/10.1016/j.jad.2026.122032>

Received 2 February 2026; Received in revised form 12 May 2026; Accepted 25 May 2026

Available online 5 June 2026

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Garnett and Curtin, 2023), whereas hanging and drug poisoning are more frequent in many high-income countries, including Denmark (Konieczna et al., 2023). Low firearm ownership and restrictive gun regulation are characteristic of many European countries, including Denmark, Germany, the Netherlands, Norway and Sweden (European Parliament and Council of the European Union, 2021). The global variations in suicide methods indicate that the choice of method is rarely random. Instead, it results from a complex interplay of personal, socio-cultural, and environmental factors (Hawton et al., 2024; Stack, 2021). The availability and accessibility of specific methods are among the strongest predictors of method choice, as people tend to use what is most easily accessible in their immediate surroundings. The popularity of certain methods, in some cases influenced by media coverage, socio-cultural norms, and popularity/social acceptability, can increase the prominence of specific methods (Sufrate-Sorzano et al., 2023). Other factors influencing method choice include lethality, immediacy of effect, and the level of pain or violence involved (Marzano et al., 2021). Additionally, factors such as sex, age, education, marital status, previous suicide attempts, and physical disease or psychiatric disorder are associated with suicide method choice. These factors influence not only the availability and accessibility of certain methods, but also perceptions of their lethality, social acceptability, and feasibility within different personal and cultural contexts (Cai et al., 2021; H. Kim et al., 2021; Kölves et al., 2018; Mergl et al., 2015; Trott et al., 2025).

While certain risk factors related to suicide methods have been identified, knowledge regarding the mechanism of choice process remains limited. Understanding the characteristics of individuals who died by suicide and the methods they used is crucial for assessing suicide risk in clinical settings and developing more robust and effective suicide prevention strategies.

The present retrospective register-based cohort study of all suicide cases aimed to examine the sociodemographic and clinical characteristics of individuals who died by different suicide methods in Denmark from 2010 to 2020.

2. Methods

2.1. Study design

We conducted a nationwide retrospective register-based cohort study of all suicide decedents in Denmark from 2010 to 2020 examining associations between used patient characteristics and suicide methods.

2.2. Data sources

Data from health registers were linked through the use of a unique personal identification number assigned to all Danish citizens (Schmidt et al., 2019). The following registers were utilized: 1) *The Danish Civil Person Registry*, which contains data on demographic and migrations (Schmidt et al., 2014). 2) *The Danish National Patient Registry (DNPR)* includes data on all somatic and psychiatric hospital admissions (Schmidt et al., 2015). 3) *The Danish National Health Service Register*, which includes data on contacts to general practice, psychologists, and other medical specialists (Sahl Andersen et al., 2011). 4) *The National Prescription Registry* contains data on all prescription drugs redeemed (Wallach Kildemoes et al., 2011). 5) *The Danish Register of Causes of Death* includes information on all causes of death (Helweg-Larsen, 2011).

2.3. Study population

All Danish citizens who died by suicide from January 1, 2010, to December 31, 2020, were included. Individuals were eligible if they were at least 10 years old on the index date, defined as the date of death by suicide. Exclusion criteria were incomplete data during a 10-year timeframe prior to the suicide date or less than 10 years of age ($n = 350$).

2.4. Study variables

2.4.1. Outcome variables

The suicide methods were categorized into eight groups according to the ICD-10 X-codes (World Health Organization, 2014): hanging (X70), poisoning by drugs (X60–64), poisoning by other substances (X65–69), firearms (X72–X75), jumping (X80–X81), drowning (X71), sharp objects (X78) and other methods (X76–X77, X79, X82–X84). ‘Other less common methods’ included fire (X76), hot vapours (X77), cutting/piercing with a blunt object (X79), crashing (X82), other specified and classifiable means (X83) and other unspecified means (X84).

2.4.2. Sociodemographic and clinical variables

To compare suicide methods, the following sociodemographic variables were included: sex, age (below 25, 25–44, 45–64 and 65+ years old), country of origin (Denmark or not Denmark), marital status, child status (yes/no), living circumstances (alone or living together), housing type, educational status, occupation, disposable household income and socio-economic classification. Clinical variables comprised hospitalizations in psychiatric and somatic departments, healthcare contacts with private psychiatrist, private psychologist, and general practitioner (GP), history of suicide attempt(s) (SA), diagnosis of psychiatric disorders and somatic diseases, and use of psychotropic drugs. Hospitalizations were defined as admissions of more than 12 h, and only the most prevalent and/or severe chronic conditions were included. Hospital contacts were assessed 1 month, 1 year, and 5 years prior to date of suicide/index date, while psychiatric and somatic diagnoses were examined up to 10 years prior. Use of psychotropic drugs was examined in the 5 years prior to suicide. Income was corrected for inflation and measured in 2015 prices with low income defined as 50% and high income as 150% of the median disposable income. Missing data were categorized as ‘Unknown’. Additional details are provided in supplementary Tables S1 and S2.

2.5. Statistical analysis

Descriptive statistics were presented at the index date as means and standard deviations (SD) for continuous variables, and as frequencies and percentages for categorical variables, including missing data. Multinomial logistic regression was chosen to model the outcome, methods of suicide. Associations between variables and suicide methods were examined using both crude and adjusted multinomial logistic regression analyses, with suicide method as the dependent outcome and sociodemographic and clinical variables as predictors.

In adjusted models, forward selection was applied with a p -value threshold of 0.10 for variable inclusion. Hanging was chosen as the reference category, as it is the most frequent category in population, for all multinomial logistic regression models. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were reported for all analyses, and a significance level set at $\alpha = 0.05$. To reduce the risk of type one error due to multiple testing, we applied Holm-Bonferroni correction separately for all crude estimates and adjusted estimates derived from the forward selection procedure within each outcome analysis. The symbol † indicates associations with raw p -values < 0.05 . Statistical significance was determined using Holm-Bonferroni-adjusted p -values and is indicated by *. All statistical analyses were conducted using proc logistic in SAS-version 9.4.

2.6. Ethics

Studies based entirely on registry data do not require approval from an ethics review board according to the Danish law (Thygesen et al., 2011). The authors are restricted by law from sharing individual-level data.

3. Results

3.1. Descriptive characteristics of the subjects

The total sample included 6257 individuals who died by suicide from 2010 to 2020. 72.9% (4559) were males and 27.1% (1698) females with mean ages of 55 years (SD = 17.92; range = 11–101) and 56 years (SD = 18.58 years; range = 13–101) respectively. The total mean age was 55 years (SD = 18.11; range = 11–101). Further descriptive statistics by suicide methods are shown in Table 1.

3.2. Characteristics by suicide methods

3.2.1. Distribution of suicide methods

Within the study period, hanging was found to be the most frequent method of suicide (39.7%), followed by self-poisoning with drugs (21.2%), firearms (9.5%), jumping (9.3%), self-poisoning with other substances (7.2%), drowning (5.2%), sharp object (4.8%). ‘Other methods’ accounted for 3.0% of remaining suicides, the most prevalent being fire (52.4%), crashing (26.2%), other specified and classifiable means (17.3%), other unspecified means (2.6%) and cutting/piercing with a blunt object (1.6%) (Table 1). Among cases of jumping, 56.8% involved jumping from heights, whereas 43.2% involved jumping before a moving object. Suicide methods by sex and age are shown in supplementary Fig. S1 and Table S3.

3.2.2. Risk factors associated with suicide methods

Table 2 presents ORs with 95%CI from the adjusted analyses, whereas Table S4 presents results from the crude analyses.

3.2.3. Hanging (reference outcome)

Individuals who died by hanging were primarily males (79.5%) in all age groups, females under 25 years of age (63.3%) and Danish origin (94.9%) (Fig. S1 and Table S3). They were single (40.1%) or married (32.9%), did not have children (80.2%), lived alone (58.5%) or together (41.6%), in houses (64.5%) and had high school education (40.8%). Most had a middle income (58.9%) and were employed (33.9%) or old-age and non-old pensioners (29.4%).

The majority had not been hospitalized in psychiatric department (59.4%) but had been admitted to a somatic department either 1 year (27.7%) or 5 years (29.2%) prior to suicide death. Most had not been in contact with a private psychiatrist (90.3%) or private psychologist (90.5%), but a significant proportion had seen a GP within 1 month (60.2%) before death.

A large majority had no history of suicide attempt(s) (72.4%). Nearly half (48.5%) had a diagnosed mental disorder, most mood disorder (25.2%), other stress disorder (22.2%), alcohol abuse (17.0%). 33.8% had a somatic disease, including ischemic heart disease (7.4%), chronic lung disease (5.8%), traumatic brain injury (TBI) (5.2%) or diabetes (5.2%).

Use of psychotropic drugs was common (66.4%), particularly antidepressants (48.7%) or benzo-diazepines or derivatives drugs (42.4%).

3.2.4. Other methods of suicide

Self-poisoning with drugs was significantly associated with female sex (male: OR = 0.37, 95%CI [0.31–0.44]), living in apartments (OR = 1.49, 95%CI [1.24–1.80]) and early retirement (OR = 2.82, 95%CI [2.15–3.70]). The absence of psychiatric admissions (no admission 1 month prior: OR = 0.33, 95%CI [0.25–0.44]; no admission 1 year prior: OR = 0.62, 95%CI [0.49–0.80]), somatic diseases (chronic lung disease: OR = 1.66, 95%CI [1.27–2.18]; diabetes (OR = 1.67, 95%CI [1.24–2.25]), use of psychotropics (OR = 1.61, 95%CI [1.25–2.07]), and a history of suicide attempts (OR = 1.46, 95%CI [1.22–1.73]) were also identified as independent factors.

Suicide by firearms was significantly associated with male sex (OR = 10.11, 95%CI [5.58–18.32]), living in owner-occupied housing (renter-

occupied housing: OR = 0.59, 95%CI [0.45–0.76]), and the absence of recent psychiatric admissions (no admission 1 month prior: OR = 0.42, 95%CI [0.27–0.64]).

Jumping was significantly associated with living in apartments (OR = 2.52, 95%CI [1.97–3.22]) and early retirement (1.87, 95%CI [1.33–2.64]). Psychiatric admissions (admission 1 month prior: OR = 2.52, 95%CI [1.87–3.40]); admission 1 year prior: OR = 1.97, 95%CI [1.46–2.66]); admission 5 year prior: OR = 1.84, 95%CI [1.31–2.58]), as well as diagnosis of OCD (OR = 3.65, 95%CI [1.71–7.76]), and psychotic disorder (OR = 1.69, 95%CI [1.25–2.27]), were also associated with this method.

Drowning was significantly associated with female sex (male: OR = 0.39, 95%CI [0.29–0.51]), and early retirement (2.70, 95%CI [1.68–4.36]).

For self-poisoning with other substances, suicide by sharp objects, and other less common methods, associations were significant only based on raw p-values and did not remain significant after adjustment for multiple testing. Associations based on raw p-values are presented in Table 2.

4. Discussion

In this nationwide Danish retrospective register-based cohort study of all suicide deaths during 2010 and 2020, we identified distinct sociodemographic and clinical profiles associated with different suicide methods.

The associations with self-poisoning with drugs observed in our study are consistent with previous studies reporting a predominance of this method among females (Choi et al., 2022; Geith et al., 2025; Kølves et al., 2018), individuals with affective disorders (Albano et al., 2022; Geith et al., 2025) and a history of suicide attempts (Kølves et al., 2018; Lumpe et al., 2022; Men et al., 2024).

The profile for firearm suicide aligns with other international research suggesting that firearm suicide is more closely linked to access and familiarity (Bond et al., 2021; Mikolić et al., 2024) rather than recent contact with mental health services (Corcoran and Nagar, 2010; Kalesan et al., 2018; Koo et al., 2019; Śmigielski et al., 2021). The higher prevalence of firearm use among males (Bond et al., 2021; Mikolić et al., 2024) may be explained by easier access through hunting or sport shooting, and greater technical familiarity. In contrast, lower firearm use among females may reflect a stronger aversion to violent methods, possibly influenced by concerns related to bodily appearance after death (Hawton, 2000). Interestingly, this gender pattern was not observed among younger males, which could be related to lower firearm ownership in this age group (Karp, 2018), potentially driven by increasingly restrictive firearm legislation limiting access for new, (younger) owners in Denmark. Older studies have demonstrated an inverse association between a history of mental disorder, prior suicide attempt and firearm ownership, indicating that individuals with mental disorder and previous suicide attempt are less likely to possess firearms (Ilgen et al., 2008; Simpson, 2007). This profile is particularly salient in firearm suicides, suggesting that the choice of a firearm as a suicide method is often associated with stressful life events, as relationship and income (Corcoran and Nagar, 2010; Kalesan et al., 2018; Koo et al., 2019; Śmigielski et al., 2021). Our study supports the literature on that subject. Studdert et al., 2020 showed that males who own handguns are eight times more likely to die by firearm suicide than males who do not own handguns.

Individuals who died by jumping were more likely to have had recent psychiatric admissions and to have been diagnosed with psychotic disorders. This aligns with a recent systematic review and meta-analysis by (Trott et al., 2025), which reported that individuals with schizophrenia had 3.38 times higher odds of suicide by jumping compared to those without severe mental disorder. Jumping was relatively common among individuals with OCD, though systematic research on this behavior is scarce. A study by (S. T. Kim et al., 2023) demonstrated that OCD-related distress, especially when combined with depression or anxiety, can lead

Table 1
Characteristics by suicide methods.

	Hanging		Self-poisoning with drugs		Self-poisoning with other subs.		Firearms		Jumping		Drowning		Sharp objects		Other less common methods	
	N = 2484 (39.7%)		N = 1327 (21.2%)		N = 453 (7.2%)		N = 593 (9.5%)		N = 584 (9.3%)		N = 323 (5.2%)		N = 302 (4.8%)		N = 191 (3.0%)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<i>Years 2010–2020</i>																
<i>Sex</i>																
Male	1974	(79.5)	649	(48.9)	383	(84.6)	581	(98.0)	419	(71.8)	175	(54.2)	234	(77.5)	144	(75.4)
Female	510	(20.5)	678	(51.1)	70	(15.5)	12	(2.0)	165	(28.3)	148	(45.8)	68	(22.5)	47	(24.6)
<i>Age</i>																
Mean (range)	54	(11–101)	58	(13–101)	51	(18–92)	59	(12–95)	52	(14–95)	63	(16–98)	58	(21–97)	52	(17–98)
Below 25	213	(8.6)	36	(2.71)	19	(4.2)	21	(3.5)	57	(9.8)	11	(3.4)	6	(2.0)	15	(7.9)
25–44	575	(23.2)	244	(18.4)	118	(26.1)	94	(15.9)	155	(26.5)	44	(13.6)	46	(15.2)	45	(23.6)
45–64	947	(38.1)	581	(43.8)	240	(53)	242	(40.8)	225	(38.5)	97	(30.0)	148	(49.0)	83	(43.5)
65+	749	(30.2)	466	(35.1)	76	(16.8)	236	(39.8)	147	(25.2)	171	(52.9)	102	(33.8)	48	(25.1)
<i>Country of origin</i>																
Not Denmark	127	(5.1)	55	(4.1)	19	(4.2)	13	(2.2)	53	(9.1)	21	(6.5)	12	(4.0)	15	(7.9)
Denmark	2357	(94.9)	1272	(95.9)	434	(95.8)	580	(97.8)	531	(90.9)	302	(93.5)	290	(96.0)	176	(92.2)
<i>Marital status</i>																
Single	995	(40.1)	405	(30.5)	185	(40.8)	169	(28.5)	276	(47.3)	87	(26.9)	112	(37.1)	77	(40.3)
Divorced	445	(17.9)	387	(29.2)	100	(22.1)	130	(21.7)	101	(17.3)	52	(16.1)	78	(25.8)	37	(19.4)
Widowed and other	228	(9.2)	195	(14.7)	21	(4.6)	49	(8.17)	55	(9.4)	52	(16.1)	23	(7.6)	9	(4.7)
Married	816	(32.9)	340	(25.6)	147	(32.5)	245	(41.8)	152	(26.0)	132	(40.9)	89	(29.5)	68	(35.6)
<i>Living circumstances</i>																
Alone	1458	(58.4)	951	(71.6)	263	(57.9)	306	(51.0)	388	(66.55)	179	(55.83)	210	(69.84)	115	(60.21)
Living together	1026	(41.6)	376	(28.4)	190	(42.1)	287	(49.0)	196	(33.45)	144	(44.17)	92	(30.16)	76	(39.79)
<i>Children</i>																
No	1993	(80.2)	1204	(90.7)	358	(79.0)	485	(81.8)	487	(83.4)	283	(87.6)	275	(91.1)	150	(78.5)
Yes	491	(19.8)	123	(9.3)	95	(21.0)	108	(18.2)	97	(16.6)	40	(12.4)	27	(8.9)	41	(21.5)
<i>Type of occupancy</i>																
Renter-occupied housing	1253	(50.4)	908	(68.4)	214	(47.2)	176	(29.7)	410	(70.2)	162	(50.2)	182	(60.3)	106	(55.5)
Owner-occupied housing	1231	(49.6)	419	(31.6)	239	(52.8)	417	(70.3)	174	(29.8)	161	(49.9)	120	(39.7)	85	(44.5)
<i>Housing type</i>																
Apartments	762	(30.7)	625	(47.1)	127	(28.0)	105	(17.7)	324	(55.5)	115	(35.6)	133	(44.0)	63	(33.0)
Other housing and unknown	119	(4.8)	63	(4.8)	19	(4.2)	13	(2.2)	38	(6.5)	10	(3.1)	12	(4.0)	13	(6.8)
Houses	1603	(64.5)	639	(48.2)	307	(67.8)	475	(80.1)	222	(38.0)	198	(61.3)	157	(52.0)	115	(60.2)
<i>Educational status</i>																
High school	1014	(40.8)	477	(36.0)	215	(47.5)	279	(47.1)	216	(37.0)	121	(37.5)	138	(45.7)	76	(39.8)
College/University	453	(18.2)	269	(20.3)	104	(23.0)	120	(20.2)	148	(25.3)	66	(20.4)	62	(20.5)	34	(17.8)
Primary school	946	(38.1)	532	(40.1)	121	(26.7)	185	(31.2)	209	(35.8)	128	(39.6)	89	(29.5)	76	(39.8)
Unknown	71	(2.9)	49	(3.7)	13	(2.9)	9	(1.5)	11	(1.9)	8	(2.5)	13	(4.3)	5	(2.6)
<i>Occupation</i>																
Agriculture, forestry and fishing	76	(3.1)	15	(1.1)	13	(2.9)	41	(6.9)	6	(1.0)	5	(1.6)	5	(1.7)	4	(2.1)
Building and civil engineering	166	(6.7)	34	(2.6)	44	(9.7)	51	(8.6)	15	(2.6)	13	(4.0)	24	(8.0)	10	(5.2)
Business economics, administration and law	213	(8.6)	176	(13.3)	44	(9.7)	45	(7.6)	65	(11.1)	43	(13.3)	35	(11.6)	22	(11.5)
Engineering technology and industrial production	199	(8.0)	57	(4.3)	46	(10.2)	67	(11.3)	38	(6.5)	15	(4.6)	32	(10.6)	13	(6.8)
Mechanics and metal	255	(10.3)	64	(4.8)	49	(10.8)	98	(16.5)	41	(7.0)	19	(5.9)	36	(11.9)	18	(9.4)
Social and health	172	(6.9)	194	(14.6)	42	(9.3)	21	(3.5)	49	(8.4)	37	(11.5)	18	(6.0)	13	(6.8)
Other	357	(14.4)	198	(14.9)	76	(16.8)	75	(12.7)	138	(23.6)	50	(15.5)	47	(15.6)	28	(14.7)
Unknown	946	(38.1)	532	(40.1)	121	(26.7)	185	(31.2)	209	(35.8)	128	(39.6)	89	(29.5)	76	(39.8)
Elementary	100	(4.0)	57	(4.3)	18	(4.0)	10	(1.7)	23	(3.9)	13	(4.0)	16	(5.3)	7	(3.7)
<i>Disposable family income</i>																
High income	755	(30.4)	242	(18.2)	156	(34.4)	222	(37.4)	165	(28.3)	90	(27.9)	74	(24.5)	55	(28.8)
Middle income	1464	(58.9)	983	(74.1)	258	(57.0)	336	(56.7)	342	(58.6)	212	(65.6)	208	(68.9)	109	(57.1)
Low income	265	(10.7)	102	(7.7)	39	(8.6)	35	(5.9)	77	(13.2)	21	(6.5)	20	(6.6)	27	(14.1)

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Table 1 (continued)

	Hanging		Self-poisoning with drugs		Self-poisoning with other subs.		Firearms		Jumping		Drowning		Sharp objects		Other less common methods	
	<i>N</i> = 2484 (39.7%)		<i>N</i> = 1327 (21.2%)		<i>N</i> = 453 (7.2%)		<i>N</i> = 593 (9.5%)		<i>N</i> = 584 (9.3%)		<i>N</i> = 323 (5.2%)		<i>N</i> = 302 (4.8%)		<i>N</i> = 191 (3.0%)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Socio-Economic Classification																
Self-employed	96	(3.9)	24	(1.8)	19	(4.2)	48	(8.1)	7	(1.2)	8	(2.5)	12	(4.0)	3	(1.6)
Unemployed	101	(4.1)	46	(3.5)	37	(8.2)	21	(3.5)	24	(4.1)	6	(1.9)	16	(5.3)	10	(5.2)
Early retirement	261	(10.5)	381	(28.7)	48	(10.6)	55	(9.3)	127	(21.8)	48	(14.9)	55	(18.2)	32	(16.8)
Old age and non-old pensioners	731	(29.4)	464	(35.0)	78	(17.2)	223	(37.6)	141	(24.1)	166	(51.4)	99	(32.8)	46	(24.1)
Recipients of cash benefits	224	(9.0)	143	(10.8)	31	(6.8)	21	(3.5)	65	(11.1)	16	(5.0)	26	(8.6)	16	(8.4)
Others	229	(9.2)	50	(3.8)	38	(8.4)	36	(6.1)	70	(12.0)	23	(7.1)	13	(4.3)	20	(10.5)
Employed	842	(33.9)	219	(16.5)	202	(44.6)	189	(31.9)	150	(25.7)	56	(17.3)	81	(26.8)	64	(33.5)
Hospitalization admissions prior death																
At psychiatric department																
1 month	299	(12.0)	110	(8.3)	27	(6.0)	28	(4.7)	131	(22.4)	50	(15.5)	49	(16.2)	19	(10.0)
1y	429	(17.3)	274	(20.7)	74	(16.3)	47	(7.9)	149	(25.5)	69	(21.4)	61	(20.2)	47	(24.6)
5y	281	(11.3)	231	(17.4)	62	(13.7)	55	(9.3)	90	(15.4)	46	(14.2)	36	(11.9)	19	(10.0)
No	1475	(59.4)	712	(53.7)	290	(64.0)	463	(78.1)	214	(36.6)	158	(48.9)	156	(51.7)	106	(55.5)
At somatic department																
1 month	769	(31.0)	512	(38.6)	122	(26.9)	215	(36.3)	203	(34.8)	122	(37.8)	99	(32.8)	56	(29.3)
1y	689	(27.7)	424	(32.0)	135	(29.8)	151	(25.5)	162	(27.7)	93	(28.8)	90	(29.8)	52	(27.2)
5y	726	(29.2)	322	(24.3)	140	(30.9)	156	(26.3)	160	(27.4)	82	(25.4)	80	(26.5)	61	(31.9)
No	300	(12.1)	69	(5.2)	56	(12.4)	71	(12.0)	59	(10.1)	26	(8.1)	33	(10.9)	22	(11.5)
Contact with health care																
Private psychiatrist																
1 month	44	(1.8)	40	(3.0)	13	(2.9)	13	(2.2)	26	(4.5)	7	(2.2)	14	(4.6)	5	(2.6)
1y	82	(3.3)	55	(4.1)	18	(4.0)	14	(2.4)	29	(5.0)	12	(3.7)	14	(4.6)	5	(2.6)
5y	115	(4.6)	107	(8.1)	21	(4.6)	12	(2.0)	42	(7.2)	22	(6.8)	11	(3.6)	9	(4.7)
No	2243	(90.3)	1125	(84.8)	401	(88.5)	554	(93.4)	487	(83.4)	282	(87.3)	263	(87.1)	172	(90.1)
Private psychologist																
1 month	46	(1.9)	19	(1.4)	12	(2.7)	10	(1.7)	15	(2.6)	5	(1.6)	3	(1.0)	3	(1.6)
1y	74	(3.0)	34	(2.6)	15	(3.3)	11	(1.9)	17	(2.9)	15	(4.6)	5	(1.7)	10	(5.2)
5y	116	(4.7)	97	(7.3)	31	(6.8)	21	(3.4)	37	(6.3)	12	(3.7)	21	(7.0)	11	(5.8)
No	2248	(90.5)	1177	(88.7)	395	(87.2)	552	(93.1)	515	(88.2)	291	(90.1)	273	(90.4)	167	(87.4)
General practitioner																
1 month	1495	(60.2)	973	(73.3)	263	(58.1)	362	(61.1)	358	(61.3)	204	(63.2)	208	(68.9)	114	(59.7)
1y	768	(30.9)	308	(23.2)	134	(29.6)	186	(31.4)	185	(31.7)	103	(31.9)	80	(26.5)	64	(33.5)
5y	185	(7.5)	30	(2.3)	44	(9.7)	35	(5.9)	35	(6.0)	12	(3.7)	11	(3.6)	13	(6.8)
No	36	(1.5)	16	(1.2)	12	(2.6)	10	(1.7)	6	(1.0)	4	(1.2)	3	(1.0)	0	(0.0)
History of suicide attempt																
Lifetime	686	(27.6)	586	(44.2)	104	(23.0)	103	(17.4)	194	(33.2)	97	(30.0)	88	(29.1)	61	(31.9)
No	1798	(72.4)	741	(55.8)	349	(77.0)	490	(82.6)	390	(66.8)	226	(70.0)	214	(70.9)	130	(68.1)
1 month	293	(11.8)	171	(12.9)	28	(6.2)	60	(10.1)	80	(13.7)	33	(10.2)	25	(8.3)	22	(11.5)
1y	119	(4.8)	114	(8.6)	25	(5.5)	11	(1.9)	35	(6.0)	17	(5.3)	19	(6.3)	15	(7.9)
5y	123	(5.0)	152	(11.5)	23	(5.1)	16	(2.7)	46	(7.9)	22	(6.8)	21	(7.0)	11	(5.8)
History of mental disorder 10 years prior death																
At least one mental disorder	1205	(48.5)	819	(61.7)	198	(43.7)	188	(31.7)	404	(69.2)	181	(56.0)	183	(60.6)	105	(55.0)
Mood disorders	625	(25.2)	481	(36.3)	110	(24.3)	92	(15.5)	224	(38.4)	111	(34.4)	91	(30.1)	58	(30.4)
Anxiety	159	(6.4)	128	(9.7)	31	(6.8)	19	(3.2)	64	(11.0)	30	(9.3)	24	(8.0)	14	(7.3)
Post-traumatic stress disorder	38	(1.5)	38	(2.9)	9	(2.0)	4	(0.7)	8	(1.4)	4	(1.2)	<3	–	3	(1.6)
Other stress disorders	551	(22.2)	358	(27.0)	102	(22.5)	72	(12.1)	175	(30.0)	79	(24.5)	66	(21.9)	50	(26.2)
Obsessive–compulsive disorder (OCD)	14	(0.6)	12	(0.9)	0	(0.0)	0	(0.0)	17	(2.9)	6	(1.9)	5	(1.7)	3	(1.6)
Psychotic disorder	263	(10.6)	175	(13.2)	24	(5.3)	14	(2.4)	149	(25.5)	36	(11.2)	48	(15.9)	27	(14.1)
Attention deficit hyperactivity disorder (ADHD)	86	(3.5)	44	(3.3)	5	(1.1)	3	(0.5)	13	(2.2)	5	(1.6)	12	(4.0)	6	(3.1)
Eating disorders	19	(0.8)	25	(1.9)	<3	–	0	(0.0)	10	(1.7)	4	(1.2)	<3	–	4	(2.1)

(continued on next page)

Table 1 (continued)

	Hanging		Self-poisoning with drugs		Self-poisoning with other subs.		Firearms		Jumping		Drowning		Sharp objects		Other less common methods	
	<i>N</i> = 2484 (39.7%)		<i>N</i> = 1327 (21.2%)		<i>N</i> = 453 (7.2%)		<i>N</i> = 593 (9.5%)		<i>N</i> = 584 (9.3%)		<i>N</i> = 323 (5.2%)		<i>N</i> = 302 (4.8%)		<i>N</i> = 191 (3.0%)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Substance abuse	211	(8.5)	193	(14.5)	28	(6.2)	18	(3.0)	75	(12.8)	19	(5.9)	43	(14.2)	11	(5.8)
Alcohol abuse	423	(17.0)	352	(26.5)	75	(16.6)	91	(15.4)	130	(22.3)	44	(13.6)	77	(25.5)	41	(21.5)
Dementia	51	(2.1)	23	(1.7)	6	(1.3)	8	(1.4)	18	(3.1)	10	(3.1)	6	(2.0)	<3	–
Borderline personality disorder	76	(3.1)	85	(6.4)	8	(1.8)	<3	–	20	(3.4)	4	(1.2)	5	(1.7)	5	(2.6)
Other personality disorder	159	(6.4)	127	(9.6)	27	(6.0)	8	(1.4)	49	(8.4)	7	(2.2)	24	(8.0)	15	(7.9)
Autism spectrum disorder	33	(1.3)	12	(0.9)	3	(0.7)	<3	–	11	(1.9)	6	(1.9)	<3	–	7	(3.7)
History of somatic disease 10 years prior death																
At least one somatic disease	839	(33.8)	748	(56.4)	135	(29.8)	276	(46.5)	214	(36.6)	117	(36.2)	123	(40.7)	71	(37.2)
Chronic lung disease	145	(5.8)	212	(16.0)	19	(4.2)	51	(8.6)	41	(7.0)	18	(5.6)	34	(11.3)	9	(4.7)
Ischemic heart disease	184	(7.4)	151	(11.4)	26	(5.7)	73	(12.3)	31	(5.3)	28	(8.7)	26	(8.6)	11	(5.8)
Heart failure	78	(3.1)	71	(5.4)	11	(2.4)	33	(5.6)	12	(2.1)	15	(4.6)	13	(4.3)	7	(4.0)
Stroke	73	(2.9)	61	(4.6)	6	(1.3)	16	(2.7)	13	(2.3)	10	(3.1)	12	(4.0)	3	(1.6)
Cancer	199	(8.0)	177	(13.3)	29	(6.4)	99	(16.7)	56	(9.6)	38	(11.8)	30	(9.9)	16	(8.4)
Inflammatory bowel disease	34	(1.4)	29	(2.2)	7	(1.6)	12	(2.0)	9	(1.5)	<3	–	5	(1.7)	4	(2.1)
Rheumatoid arthritis	18	(0.7)	25	(1.9)	<3	–	6	(1.0)	3	(0.5)	3	(0.5)	5	(1.7)	0	(0.0)
Kidney disease	48	(1.9)	44	(3.3)	5	(1.1)	18	(3.0)	15	(2.6)	6	(1.9)	9	(3.0)	7	(3.7)
Psoriasis	11	(0.4)	17	(1.3)	5	(1.1)	<3	–	5	(0.9)	<3	–	<3	–	<3	–
Epilepsy	66	(2.7)	70	(5.3)	9	(2.0)	18	(3.0)	21	(3.6)	13	(4.0)	6	(2.0)	<3	–
Traumatic brain injury (TBI)	129	(5.2)	98	(7.4)	14	(3.1)	44	(7.4)	47	(8.1)	17	(5.3)	21	(7.0)	17	(8.9)
Diabetes	128	(5.2)	153	(11.5)	20	(4.4)	55	(9.3)	27	(4.6)	10	(3.1)	18	(6.0)	9	(4.7)
Multiple sclerosis	12	(0.5)	8	(0.6)	3	(0.7)	<3	–	<3	–	0	(0.0)	<3	–	<3	–
Obesity	76	(3.1)	121	(9.1)	16	(3.5)	15	(2.5)	24	(4.1)	8	(2.5)	13	(4.3)	15	(7.9)
Drugs 5 years prior death																
At least one psychotropic drug	1650	(66.4)	1163	(87.6)	282	(62.3)	350	(59.0)	449	(76.9)	242	(74.9)	222	(73.5)	130	(68.1)
Drugs used in opioid dependence	42	(1.7)	110	(8.3)	7	(1.6)	10	(1.7)	21	(3.6)	<3	–	11	(3.6)	3	(1.6)
Drugs used in alcohol dependence	278	(11.2)	205	(15.5)	58	(12.8)	76	(12.8)	64	(11.0)	33	(10.2)	44	(14.6)	24	(12.6)
Lithium	70	(2.8)	51	(3.8)	11	(2.4)	6	(1.0)	22	(3.8)	10	(3.1)	13	(4.3)	8	(4.2)
Antipsychotic drugs	676	(27.2)	559	(42.1)	114	(25.2)	88	(14.8)	243	(41.6)	108	(33.4)	121	(40.1)	59	(30.9)
1st generation antipsychotics	301	(12.1)	312	(23.5)	50	(11.0)	38	(6.4)	102	(17.5)	45	(13.9)	48	(15.9)	30	(15.7)
2nd generation antipsychotics	547	(22.0)	446	(33.6)	90	(19.9)	61	(10.3)	208	(35.6)	90	(27.9)	105	(34.8)	50	(26.2)
Antidepressants	1209	(48.7)	895	(67.5)	218	(48.1)	242	(40.8)	329	(56.3)	194	(60.1)	170	(56.3)	99	(51.8)
Benzodiazepines and derivatives	1052	(42.4)	923	(69.6)	174	(38.41)	246	(41.5)	309	(52.9)	177	(54.8)	161	(53.3)	93	(48.7)
Psychostimulants	110	(4.4)	55	(4.1)	16	(3.5)	9	(1.5)	14	(2.4)	8	(2.5)	16	(5.3)	6	(3.1)
Antidementia	13	(0.5)	3	(0.2)	0	(0.0)	<3	–	6	(1.0)	6	(1.9)	<3	–	<3	–

Note.

subs.: substances.

Table 2

Multivariate (adjusted) analysis for demographic and clinical characteristics of suicide methods (compared to hanging as a reference group).

	Self-poisoning with drugs	Self- poisoning with other subs.	Firearms	Jumping	Drowning	Sharp objects	Other less common methods
Model Adjusted							
Characteristic	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Sex							
Male	0.37^{***} (0.31–0.44)	1.38 [‡] (1.02–1.87)	10.11^{***} (5.58–18.32)	0.88 (0.70–1.11)	0.39^{***} (0.29–0.51)	0.89 (0.65–1.23)	0.88 (0.60–1.28)
Female	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Age							
Below 25	0.70 (0.37–1.32)	0.85 (0.37–1.98)	0.53 (0.24–1.13)	0.70 (0.34–1.44)	0.19 [‡] (0.07–0.52)	0.16 [‡] (0.05–0.51)	0.60 (0.19–1.87)
25–44	1.06 (0.66–1.69)	1.91 (1.01–3.63)	0.91 (0.55–1.53)	0.71 (0.38–1.31)	0.44 [‡] (0.22–0.90)	0.38 [‡] (0.18–0.79)	0.73 (0.28–1.87)
45–64	1.26 (0.83–1.93)	2.09 [‡] (1.15–3.80)	0.96 (0.61–1.50)	0.76 (0.43–1.35)	0.56 (0.30–1.05)	0.85 (0.44–1.63)	0.82 (0.34–1.96)
65+	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Country of origin							
Not Denmark	0.73 (0.51–1.05)	0.80 (0.48–1.32)	0.55 [‡] (0.30–0.99)	1.32 (0.92–1.89)	1.31 (0.79–2.16)	0.68 (0.37–1.27)	1.48 (0.83–2.63)
Denmark	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Marital status							
Single	0.83 (0.65–1.05)	1.24 (0.92–1.68)	1.09 (0.82–1.45)	0.93 (0.67–1.26)	0.75 (0.51–1.10)	1.16 (0.80–1.70)	0.80 (0.51–1.26)
Divorced	1.22 (0.97–1.53)	1.31 (0.96–1.80)	1.52 ^{***} (1.16–2.01)	0.87 (0.63–1.19)	0.69 (0.47–1.01)	1.25 (0.86–1.82)	0.83 (0.52–1.32)
Widowed and other	1.28 (0.97–1.69)	0.84 (0.50–1.41)	0.84 (0.58–1.23)	1.38 (0.93–2.04)	0.87 (0.59–1.29)	0.76 (0.45–1.27)	0.47 [‡] (0.22–0.99)
Married	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Type of occupancy							
Renter-occupied housing	1.33 [‡] (1.08–1.62)	0.93 (0.71–1.22)	0.59^{***} (0.45–0.76)	1.50 ^{***} (1.14–1.98)	1.09 (0.79–1.50)	1.18 (0.85–1.65)	1.06 (0.71–1.59)
Owner-occupied housing	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Housing type							
Apartments	1.49^{***} (1.24–1.80)	0.89 (0.68–1.17)	0.77 (0.58–1.03)	2.52^{***} (1.97–3.22)	1.35 (0.98–1.84)	1.57 [‡] (1.15–2.14)	1.08 (0.73–1.59)
Other housing and unknown	1.17 (0.81–1.69)	0.97 (0.57–1.65)	0.61 (0.33–1.12)	1.93 ^{***} (1.25–2.97)	0.88 (0.44–1.75)	1.10 (0.58–2.11)	1.42 (0.74–2.72)
Houses	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Occupation							
Agriculture forestry and fishing	0.74 (0.37–1.46)	0.77 (0.35–1.69)	3.53 ^{***} (1.61–7.71)	0.64 (0.24–1.70)	0.77 (0.25–2.34)	0.52 (0.18–1.51)	0.85 (0.24–3.07)
Building and civil engineering	0.72 (0.42–1.22)	1.17 (0.63–2.18)	1.85 (0.88–3.90)	0.60 (0.29–1.24)	0.96 (0.42–2.23)	1.06 (0.52–2.15)	0.98 (0.35–2.71)
Business economics. Administration and law	1.66 [‡] (1.09–2.53)	1.01 (0.55–1.86)	1.78 (0.84–3.76)	1.74 (1.00–3.02)	1.47 (0.74–2.93)	1.12 (0.58–2.17)	1.56 (0.63–3.82)
Engineering technology and industrial production	0.80 (0.50–1.29)	1.16 (0.63–2.13)	2.17 [‡] (1.05–4.49)	1.08 (0.60–1.95)	0.68 (0.30–1.52)	1.15 (0.59–2.23)	1.03 (0.39–2.70)
Mechanics and metal	0.79 (0.50–1.26)	0.85 (0.46–1.55)	2.32 [‡] (1.14–4.74)	1.19 (0.66–2.14)	0.98 (0.45–2.13)	1.06 (0.55–2.06)	1.13 (0.45–2.86)
Social and health	1.54 (0.99–2.36)	1.27 (0.68–2.39)	1.65 (0.72–3.77)	1.44 (0.80–2.57)	1.22 (0.59–2.45)	0.64 (0.30–1.35)	1.02 (0.39–2.72)
Other	1.19 (0.79–1.78)	1.10 (0.62–1.95)	1.94 (0.94–3.97)	1.73 [‡] (1.04–2.90)	1.15 (0.59–2.25)	0.94 (0.50–1.76)	1.07 (0.45–2.54)
Elementary	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Disposable family income							
High income	0.85 (0.59–1.24)	1.24 (0.76–2.03)	1.30 (0.79–2.13)	1.93 [‡] (1.27–2.94)	1.38 (0.75–2.56)	1.53 (0.80–2.92)	0.60 (0.31–1.16)
Middle income	0.97 (0.71–1.33)	1.27 (0.82–1.97)	1.12 (0.71–1.78)	1.02 (0.71–1.46)	1.12 (0.64–1.95)	1.43 (0.81–2.52)	0.63 (0.36–1.11)
Low income	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Socio-Economic Classification							
Self-employed	0.93 (0.55–1.55)	0.91 (0.53–1.55)	1.66 [‡] (1.09–2.53)	0.48 (0.21–1.08)	1.18 (0.53–2.67)	1.33 (0.68–2.60)	0.37 (0.11–1.22)
Unemployed	1.28 (0.85–1.94)	1.58 [‡] (1.03–2.42)	1.28 (0.76–2.16)	1.13 (0.68–1.88)	0.89 (0.37–2.16)	1.31 (0.72–2.39)	1.17 (0.57–2.40)
Early retirement	2.82^{***} (2.15–3.70)	1.01 (0.68–1.50)	1.87 ^{***} (1.27–2.76)	1.87^{***} (1.33–2.64)	2.70^{***} (1.68–4.36)	1.25 (0.80–1.96)	1.44 (0.84–2.45)
Old age and non-old pensioners	1.49 (0.95–2.34)	0.91 (0.50–1.67)	1.13 (0.70–1.82)	0.95 (0.52–1.73)	1.93 (0.98–3.80)	1.00 (0.50–1.99)	0.69 (0.28–1.74)
Recipients of cash benefits	1.55 [‡] (1.12–2.13)	0.87 (0.55–1.37)	0.98 (0.58–1.67)	1.12 (0.75–1.67)	1.28 (0.67–2.43)	1.04 (0.60–1.78)	0.76 (0.39–1.49)

(continued on next page)

Table 2 (continued)

	Self-poisoning with drugs	Self- poisoning with other subs.	Firearms	Jumping	Drowning	Sharp objects	Other less common methods
Model Adjusted							
Characteristic	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Others	1.11 (0.73–1.70)	1.23 (0.76–2.01)	1.55 (0.91–2.64)	1.75 [‡] (1.15–2.66)	2.61 ^{‡‡} (1.38–4.96)	1.23 (0.60–2.52)	1.10 (0.55–2.19)
Employed	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hospitalization admissions prior death							
At psychiatric department							
1 month	0.33^{†††,***} (0.25–0.44)	0.63 [‡] (0.42–0.93)	0.42^{†††,***} (0.27–0.64)	2.52^{†††,***} (1.87–3.40)	1.78 ^{‡‡} (1.21–2.62)	1.08 (0.72–1.62)	0.78 (0.46–1.34)
1y	0.62^{†††,***} (0.49–0.80)	1.12 (0.80–1.56)	0.61 [‡] (0.42–0.88)	1.97^{†††,***} (1.46–2.66)	1.72 ^{‡‡} (1.17–2.54)	0.96 (0.64–1.44)	1.30 (0.82–2.07)
5y	0.84 (0.65–1.09)	1.07 (0.73–1.56)	1.07 (0.74–1.53)	1.84^{†††,***} (1.31–2.58)	1.89 ^{‡‡} (1.25–2.86)	1.06 (0.68–1.66)	0.71 (0.38–1.32)
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00
History of suicide attempt							
Lifetime	1.46^{†††,***} (1.22–1.73)	0.89 (0.68–1.15)	0.87 (0.67–1.12)	0.84 (0.67–1.05)	0.95 (0.71–1.27)	0.88 (0.66–1.19)	1.09 (0.76–1.56)
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00
History of mental disorder 10 years prior death							
Obsessive–compulsive disorder	1.50 (0.64–3.52)	VERY LOW	VERY LOW	3.65^{†††,***} (1.71–7.76)	4.35 ^{‡‡} (1.55–12.16)	2.89 (0.98–8.59)	2.83 (0.77–10.35)
Psychotic disorder	0.76 (0.58–0.99)	0.46 (0.28–0.75)	0.43 [‡] (0.23–0.78)	1.69^{†††,***} (1.25–2.27)	0.97 (0.62–1.53)	1.03 (0.68–1.57)	1.15 (0.67–1.97)
Attention deficit hyperactivity disorder (ADHD)	0.92 (0.59–1.44)	0.42 (0.16–1.08)	0.43 (0.13–1.42)	0.40 [‡] (0.21–0.75)	0.67 (0.25–1.79)	1.07 (0.54–2.15)	0.92 (0.37–2.28)
Substance abuse	1.15 (0.87–1.52)	1.03 (0.65–1.64)	1.04 (0.59–1.84)	0.82 (0.58–1.14)	0.78 (0.46–1.34)	1.55 [‡] (1.01–2.40)	0.43 [‡] (0.21–0.88)
Other personality disorder	0.91 (0.67–1.23)	1.19 (0.75–1.88)	0.50 (0.23–1.07)	0.78 (0.53–1.13)	0.27 ^{‡‡} (0.12–0.61)	0.88 (0.53–1.44)	1.15 (0.62–2.11)
None or not having the diagnose	1.00	1.00	1.00	1.00	1.00	1.00	1.00
History of somatic disease 10 years prior death							
At least one somatic disease	1.39 ^{‡‡} (1.13–1.72)	1.15 (0.84–1.59)	1.17 (0.88–1.59)	0.86 (0.64–1.16)	0.83 (0.58–1.19)	0.92 (0.64–1.33)	0.89 (0.56–1.43)
Chronic lung disease	1.66^{†††,***} (1.27–2.18)	0.82 (0.48–1.41)	1.32 (0.90–1.92)	1.19 (0.79–1.79)	0.76 (0.44–1.32)	1.74 [‡] (1.10–2.75)	
Cancer	1.16 (0.88–1.52)	0.92 (0.58–1.48)	1.64 [‡] (1.18–2.28)	1.61 [‡] (1.10–2.37)	1.25 (0.80–1.96)	1.15 (0.71–1.85)	1.20 (0.64–2.26)
Traumatic brain injury (TBI)	1.05 (0.75–1.47)	0.56 (0.30–1.04)	1.73 [‡] (1.13–2.64)	1.53 (1.03–2.38)	1.40 (0.77–2.53)	1.48 (0.85–2.57)	1.89 [‡] (1.00–2.35)
Diabetes	1.67^{†††,***} (1.24–2.25)	0.85 (0.50–1.45)	1.51 [‡] (1.03–2.21)	0.89 (0.56–1.44)	0.57 (0.28–1.14)	0.99 (0.57–1.73)	0.89 (0.42–1.87)
Multiple sclerosis							
Obesity	1.46 [‡] (1.03–2.07)	1.18 (0.65–2.14)	0.99 (0.54–1.81)	1.14 (0.68–1.91)	0.77 (0.35–1.69)	1.18 (0.62–2.24)	2.69 [‡] (1.39–5.19)
None or not having the diagnose	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Drugs 5 years prior death							
At least one psychotropic drug	1.61^{†††,***} (1.25–2.07)	0.92 (0.69–1.22)	0.86 (0.65–1.13)	0.93 (0.69–1.25)	0.89 (0.61–1.31)	0.82 (0.56–1.20)	0.77 (0.49–1.22)
Drugs used in opioid dependence	2.55^{†††,***} (1.69–3.83)	1.01 (0.44–2.33)	1.26 (0.60–2.68)	1.67 (0.94–2.96)	0.37 (0.09–1.59)	1.60 (0.78–3.29)	0.94 (0.28–3.18)
2nd generation antipsychotics	1.30[‡] (1.05–1.61)	1.18 (0.86–1.62)	0.91 (0.64–1.28)	0.95 (0.73–1.23)	1.14 (0.81–1.61)	1.75 [‡] (1.23–2.48)	1.05 (0.67–1.65)
Benzodiazepines and derivates	1.51^{†††,***} (1.24–1.84)	0.97 (0.74–1.28)	1.30 (1.00–1.70)	1.18 (0.93–1.52)	1.07 (0.78–1.48)	1.19 (0.86–1.65)	1.41 (0.94–2.13)
None drugs	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note. subs. = substances.

‡ Raw p-values:

* Adjusted p-values (Holm–Bonferroni):

Bold indicates statistically significant adjusted p-values ($p < 0.05$).‡ $p < 0.05$.‡‡ $p < 0.01$.‡‡‡ $p < 0.001$.* $p < 0.05$.** $p < 0.01$.*** $p < 0.001$.

to impulsive suicidal behavior.

Although suicide by drowning occurs across all age groups, it is not a frequent method among younger individuals (Berkelmans et al., 2020). Research have shown that females and individuals aged 65 and older are at increased risk of suicide by drowning (Haw and Hawton, 2016; Puzo et al., 2016; Rivart et al., 2024). However, significant gender differences in drowning exist across countries (Cenderadewi et al., 2020; Haw and Hawton, 2016; Wu et al., 2021). A history of mental disorder, particularly mood disorders such as depression, is strongly associated with suicide by drowning (Peden et al., 2022).

Research on suicides involving sharp objects is limited. A recent UK study (Rivart et al., 2024), reported that individuals who died by sharp objects were older, had recent contact with health services and more likely to have schizophrenia. Nielssen and Large, 2011 reported that many suicide attempt survivors had untreated psychosis. Additional studies have identified depression and personality disorders, alongside schizophrenia, as prevalent diagnoses within this category (Abdullah et al., 2003; De-Giorgio et al., 2015; Venara et al., 2013). Moreover, alcohol or substance abuse is frequently observed (Badger et al., 2012). However Park et al., 2017 reported that this method, along with self-poisoning, is more common among individuals with mild alcohol intoxication and chronic psychiatric disorder, whereas acute moderate intoxication is associated with more lethal methods.

Hanging, which was used as the reference category, was predominantly observed among males across all age groups. The results were partially consistent with findings in the study of Mikolić et al., 2024, showing that hanging is most prevalent in both sexes and all age groups. Partial similar to other studies (Men et al., 2024; Mikolić et al., 2024), we found that hanging was common in both single or cohabiting which can be explained by different sex-age distribution in our profile. Most individuals had a middle income and were employed, findings consistent with previous research (Kölves et al., 2018; Men et al., 2024; Reisch et al., 2019; Rivart et al., 2024), linking this method with relationship and financial stress. Our findings also show associations with mood and stress-related disorders. Additionally, our finding also suggest that hanging may be associated with low impulse control, alcohol misuse and acute suicidal crises, rather than being influenced by mental or physical health conditions.

5. Limitations

This is the first large-scale nationwide study to examine risk patterns across suicide methods, providing valuable insights. Limitations include low model fit due to small sample sizes for some suicide methods, and the inability to distinguish between jumping from heights and in front of vehicles. Additionally, rare suicide methods and occupations were grouped as "Other," limiting detailed analysis of these categories. Finally, a lack of full consistency between raw and adjusted *p*-values for some associations, suggests that the statistical significance of these findings depends on the method used to account for multiple comparisons. As a robustness check, backward selection was conducted and yielded model specifications similar to those obtained using forward selection, with discrepancies confined to variables with borderline statistical significance. This supports the overall stability of the identified associations; however, results should be interpreted with caution given the data-driven nature of the selection procedures (Heinze et al., 2018).

6. Suicide intervention

Suicide by hanging, drowning, or jumping remains particularly challenging to prevent due to the high accessibility and the minimal preparation associated with these methods. Such characteristics limit the efficacy of traditional means-restriction strategies. The findings of this study underscore the significance of sex, relationship status, access to means, and non-help-seeking behavior as key predictors of violent suicide. Although sex alone does not fully explain method choice, it

remains a critical factor in prevention efforts, particularly in relation to the availability of lethal means. Interventions that address maladaptive masculine coping strategies during periods of social, financial, or relational crisis may contribute to reducing the incidence of violent suicides.

Suicide methods such as self-poisoning, jumping, and drowning are more frequently observed among females compared to hanging. These methods are also more commonly associated with help-seeking behaviors, including engagement with treatment for somatic and psychiatric conditions. This pattern presents a crucial opportunity for suicide prevention, as individuals employing these methods are often already in contact with the healthcare system.

Healthcare professionals must recognize the link between the treatment of severe somatic diseases, psychiatric disorders, and suicide risk. This awareness should inform the implementation of systematic suicide risk assessments during periods of increased vulnerability, alongside the provision of appropriate psychosocial support and clinical care for individuals experiencing severe distress. Effective prevention and intervention require an approach that focuses on the patient and considers biological, psychological, and social factors together.

7. Conclusion

This study identified clear sex-related differences in suicide methods, with males more frequently using violent methods, and females more often employing methods, that are non-violent. Method choice was shaped by both accessibility and clinical factors. Firearms use was strongly linked to firearm access, hanging to interpersonal stressors among individuals with affective disorders, and jumping to psychotic disorders.

Self-poisoning with drugs was associated with prior suicide attempts, and affective disorders, whereas self-poisoning with other substances was more common among individuals without known health issues. Certain diagnoses, including OCD, were associated with a higher risk of using violent method, such as jumping.

CRediT authorship contribution statement

Agnieszka Konieczna: Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Methodology, Formal analysis, Conceptualization. **Mette Reilev:** Writing – review & editing, Resources, Conceptualization. **Elsebeth Stenager:** Writing – review & editing, Resources, Conceptualization. **Erik Christiansen:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Formal analysis, Conceptualization.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to improve spelling, grammar, clarity, and readability. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2026.122032>.

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