

# Healthcare utilisation prior to suicide in persons with alcohol use disorder: national cohort and nested case–control study

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## Background

Alcohol use disorder (AUD) is common and associated with increased risk of suicide.

## Aims

To examine healthcare utilisation prior to suicide in persons with AUD in a large population-based cohort, which may reveal opportunities for prevention.

## Method

A national cohort study was conducted of 6 947 191 adults in Sweden in 2002, including 256 647 (3.7%) with AUD, with follow-up for suicide through 2015. A nested case–control design examined healthcare utilisation among people with AUD who died by suicide and 10:1 age- and gender-matched controls.

## Results

In 86.7 million person-years of follow-up, 15 662 (0.2%) persons died by suicide, including 2601 (1.0%) with AUD. Unadjusted and adjusted relative risks for suicide associated with AUD were 8.15 (95% CI 7.86–8.46) and 2.22 (95% CI 2.11–2.34). Of the people with AUD who died by suicide, 39.7% and 75.6% had a healthcare encounter <2 weeks or <3 months before the index date respectively, compared with 6.3% and 25.4% of controls

(adjusted prevalence ratio (PR) and difference (PD), <2 weeks: PR = 3.86, 95% CI 3.50–4.25, PD = 26.4, 95% CI 24.2–28.6; <3 months: PR = 2.03, 95% CI 1.94–2.12, PD = 34.9, 95% CI 32.6–37.1). AUD accounted for more healthcare encounters within 2 weeks of suicide among men than women ( $P = 0.01$ ). Of last encounters, 48.1% were in primary care and 28.9% were in specialty out-patient clinics, mostly for non-psychiatric diagnoses.

## Conclusions

Suicide among persons with AUD is often shortly preceded by healthcare encounters in primary care or specialty out-patient clinics. Encounters in these settings are important opportunities to identify active suicidality and intervene accordingly in patients with AUD.

## Keywords

Alcohol disorders; suicide; healthcare utilisation; cohort studies; prevention.

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Alcohol use disorder (AUD) affects an estimated 5% of adults worldwide and is a leading cause of morbidity and mortality.<sup>1–3</sup> AUD has been identified as among the strongest risk factors for suicidal behaviour.<sup>4–9</sup> Men or women with AUD have been reported to have more than fourfold risks of completed suicide compared with the general population, after adjusting for sociodemographic differences and other psychiatric and somatic disorders.<sup>9</sup> Because of these high risks and its high overall prevalence, AUD has been estimated to account for 20% of all disability-adjusted life-years (DALYs) lost due to suicide.<sup>10</sup> Little is known about healthcare utilisation patterns prior to suicide in persons with AUD. Such patterns may reveal key opportunities to prevent suicide in this high-risk patient population.

Several studies have explored healthcare utilisation before suicide in general populations or patient samples. Most of these studies have reported that a large majority (80–90%) of individuals who died by suicide had a healthcare encounter in the previous 1 year,<sup>11–15</sup> and approximately 30–40% had a primary care encounter in the previous 1 month.<sup>11,16</sup> Healthcare utilisation also varies across different psychiatric disorders and patient subgroups.<sup>13,14</sup> A US study of male military veterans with substance use disorders (either AUD or drug use disorders) reported that 94.6% and 55.6% had a healthcare encounter within 1 year or 1 month before suicide respectively.<sup>17</sup> However, to our knowledge, no large population-based studies have examined these patterns specifically in persons with AUD.

We conducted a large cohort and nested case–control study in Sweden to examine healthcare utilisation patterns among adults with AUD who died by suicide. Our goals were to: (a) determine

the risk of suicide among persons with AUD; (b) provide the first population-based estimates of healthcare utilisation prior to suicide in this patient population; and (c) assess for gender- and age-specific differences. The results may help inform the development of more effective healthcare intervention strategies to prevent suicide in persons with AUD.

## Method

### Study design and population

This study consisted of both cohort and nested case–control designs. First, a national cohort study was conducted of all 6 947 191 persons aged  $\geq 18$  years who had lived in Sweden for at least 2 years as of 1 January 2002, as identified in the Swedish Total Population Register. This register contains demographic information for nearly 100% of persons living in Sweden since 1968.<sup>18</sup> Within this cohort, a nested case–control study was conducted of all 2601 persons who died by suicide during 2002–2015 and who had a registration of AUD within the previous 2 years, as identified using national population registries (as described below). Each of these individuals was matched to 10 controls randomly sampled from the general population who had the same birth year, birth month and gender, and who were still living in Sweden on the respective individual's death date (the index date).

We assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki

Declaration of 1975, as revised in 2008. All procedures involving human participants were approved by the ethics committee of Lund University in Sweden (no. 2013/736). Participant consent was not required as this study used only anonymised registry-based secondary data.

### Alcohol use disorder (AUD) ascertainment

Alcohol use disorder was identified using nationwide diagnoses and alcohol-related convictions reported during 2000–2015. First, ICD codes for AUD were identified from all primary or secondary diagnoses in the Swedish Hospital, Out-Patient, and Primary Care Registries (ICD-8: 291, 303, 357F, 425F, 535D, 571A–571D, 980, V79B; ICD-9-CM: same codes as ICD-8, plus 305A; ICD-10-CM: F10, except F10.0, Z50.2, Z71.4, E24.4, G31.2, G62.1, G72.1, I42.6, K29.2, K70.0–K70.9, K85.2, K86.0, O35.4). The Swedish Hospital Registry started in 1964 and initially included all hospital discharge diagnoses from six populous counties in southern Sweden, but was gradually expanded to cover >99% of the national population since 1987.<sup>19</sup> The Out-Patient Registry started in 2001 and contains out-patient diagnoses from all specialty clinics nationwide. The Primary Care Registry initially included all primary care diagnoses from two populous counties covering 20% of the national population starting in 1998, but was expanded in 2001 to cover approximately 45% of the national population and since 2008 has covered 75%.<sup>20</sup> In addition, AUD was identified in all individuals having at least two convictions for drink-driving (law 1951:649) or drunk in charge of a maritime vessel (law 1994:1009), using nationwide data from the Suspicion and Crime Registers.

### Suicide ascertainment

The study cohort was followed up for suicide deaths from 1 January 2002 through 31 December 2015, using nationwide data from the Swedish Cause of Death Registry. This registry includes deaths and ICD codes for cause of death among all persons registered in Sweden since 1960, with compulsory reporting nationwide. All intentional deaths were identified using ICD-10-CM codes X60–X84, and deaths of undetermined intent were identified using ICD-10-CM codes Y10–Y34. Prior studies have suggested that substantial numbers of suicides may be misclassified as deaths of undetermined intent<sup>21,22</sup> and that such misclassification may be more common in persons with AUD.<sup>23,24</sup> In the present study, intentional deaths and deaths of undetermined intent were analysed together as the primary outcome and separately as secondary outcomes.

### Ascertainment of healthcare encounters

In the nested case–control study, all healthcare encounters in in-patient, specialty out-patient and primary care out-patient settings during the year prior to the index date, regardless of diagnosis, were identified using the Swedish Hospital, Out-Patient and Primary Care Registries (as described above). To exclude encounters that were the direct result of a fatal suicide attempt, hospital admissions were included only if the discharge date preceded the recorded date of death. In addition, all healthcare encounters were excluded if they occurred on the death date and contained a diagnosis directly related to mortality (i.e. ICD-10-CM R96–R99; ‘ill-defined and unspecified causes of mortality’).

### Other study variables

Sociodemographic characteristics and psychiatric disorders that may be associated with AUD, suicide and healthcare utilisation were examined as adjustment variables. Sociodemographic factors were identified from the Total Population Register and national

census data and were 100% complete. These variables included age (continuous and categorical (18–24, 25–34, 35–44, 45–54, 55–64, 65–74, ≥75 years) to allow for a non-linear effect), gender, marital status (married/unmarried) and education level (≤9, 10–12, >12 years) at baseline. Psychiatric disorders included drug use disorders (ICD-8: 304; ICD-9-CM: 292, 304–305, except 305.0 and 305.1; ICD-10-CM: F11–F16, F18–F19; Suspicion Register codes 3070, 5010–5012; Crime Register codes for laws covering narcotics (law 1968:64) and drug-related driving offences (law 1951:649)), affective disorders (ICD-8: 296.0–296.8, 300.4; ICD-9-CM: 296A–296E, 296W, 300E, 311; ICD-10-CM: F30–F39, except 32.3), anxiety/phobia disorders (ICD-8: 300.0, 300.2; ICD-9-CM: 300A, 300C; ICD-10-CM: F40–F41), psychotic disorders (ICD-8: 291, 295, 297–299; ICD-9-CM: 291–292, 295, 297–299; ICD-10-CM: F20–F25, F28–F29, F32.3, X.5 in F10–F19), personality disorders (ICD-8/9-CM: 301; ICD-10-CM: F60), and other psychiatric disorders (ICD-8: 300.1, 300.5–300.9; ICD-9-CM: 300B, 300F–300H, 300W, 300X, 307B, 307F; ICD-10-CM: F43–F45, F48, F50).

### Statistical analysis

In the national cohort analysis, Poisson regression with robust s.d. was used to determine incidence rate ratios (IRRs) and 95% confidence intervals (CIs) for suicide associated with AUD. Analyses were conducted using three models: (a) unadjusted, (b) adjusted for sociodemographic factors (age, gender, marital status, education level) and (c) further adjusted for psychiatric disorders (as above).

In the nested case–control analysis, Poisson regression with robust s.d. was used to compute prevalence ratios (PRs) and 95% CIs for the prevalence of a healthcare encounter in specific time intervals before the index date (<2 weeks, 1 month, 3 months, 6 months, 1 year) among the people with AUD compared with the controls. In addition, generalised linear models with a Poisson distribution, identity link function and robust s.d. were used to compute prevalence differences (PDs) and 95% CIs for those same prevalences in the people with AUD versus controls. Each of these models was performed both unadjusted and adjusted for covariates (as above). Poisson model goodness-of-fit was assessed using Pearson and deviance tests and was met in each model.

Interactions between AUD and gender or age were examined in relation to healthcare encounter prevalence on both the additive and multiplicative scale. In a sensitivity analysis, the analyses of healthcare utilisation were repeated after identifying AUD on the basis of any reported lifetime history rather than within the previous 2 years. All statistical tests were two-sided and used an  $\alpha$ -level of 0.05. All analyses were conducted using Stata version 15.1 for Windows.

## Results

A total of 256 647 persons (3.7% of the cohort) were identified with AUD during the study period. **Table 1** reports participant characteristics in the total cohort, those with AUD, all persons who died by suicide, and all persons who died by suicide and had an AUD registration in the previous 2 years. Compared with the total cohort, persons with AUD or who died by suicide were more likely to be ages 35–64 years, male or unmarried; have low education level, drug use or other psychiatric disorders; and/or have more frequent hospital admissions or specialty clinic encounters. In addition, persons with AUD were more likely to average at least 2 primary care encounters per year.

### AUD and risk of suicide

In 86.7 million person-years of follow-up, 15 662 (0.2%) persons in the entire cohort died by suicide (18.0 per 100 000 person-years),

**Table 1** Characteristics of study participants, 2002–2015, Sweden

	Total sample (N = 6 947 191 (100.0%)), n (%)	Alcohol use disorder (N = 256 647 (3.7%)), n (%)	Completed suicide (N = 15 662 (0.2%)), n (%)	Completed suicide and alcohol use disorder (N = 2601 (0.04%)), n (%)
Age at baseline, years				
18–24	710 230 (10.2)	21 985 (8.6)	1489 (9.5)	218 (8.4)
25–34	1 161 433 (16.7)	35 040 (13.6)	2243 (14.3)	388 (14.9)
35–44	1 239 781 (17.9)	56 503 (22.0)	3217 (20.5)	708 (27.2)
45–54	1 188 344 (17.1)	64 305 (25.1)	3307 (21.1)	753 (29.0)
55–64	1 115 880 (16.1)	53 530 (20.9)	2668 (17.0)	431 (16.6)
65–74	739 552 (10.6)	19 384 (7.5)	1502 (9.6)	92 (3.5)
≥75	791 971 (11.4)	5900 (2.3)	1236 (7.9)	1 (0.4)
Gender				
Male	3 403 918 (49.0)	189 634 (73.9)	10 944 (69.9)	1974 (75.9)
Female	3 543 273 (51.0)	67 013 (26.1)	4718 (30.1)	627 (24.1)
Education level, years				
≤9	1 859 915 (26.8)	82 381 (32.1)	5215 (33.3)	841 (32.3)
10–12	2 923 018 (42.1)	130 035 (50.7)	7333 (46.8)	1363 (52.4)
>12	2 164 257 (31.1)	44 231 (17.2)	3114 (19.9)	397 (15.3)
Marital status				
Married	2 996 887 (43.1)	77 108 (30.0)	5083 (32.4)	647 (24.9)
Unmarried	3 950 304 (56.9)	179 539 (70.0)	10 579 (67.6)	1954 (75.1)
Drug use disorders	177 641 (2.6)	65 279 (25.4)	3607 (23.0)	1235 (47.5)
Affective disorders	1 055 768 (15.2)	101 479 (39.5)	7035 (44.9)	1458 (56.1)
Anxiety/phobia disorders	760 977 (11.0)	83 671 (32.6)	4335 (27.7)	1163 (44.7)
Psychotic disorders	156 581 (2.3)	31 289 (12.2)	2488 (15.9)	560 (21.5)
Personality disorders	84 888 (1.2)	20 266 (7.9)	1727 (11.0)	443 (17.0)
Other psychiatric disorders	799 988 (11.5)	61 040 (23.8)	3509 (22.4)	776 (29.8)
Hospital admissions (total)				
0	2 567 361 (37.0)	42 174 (16.4)	4030 (25.7)	211 (8.1)
1	1 263 252 (18.2)	35 910 (14.0)	2435 (15.6)	255 (9.8)
≥2	3 116 578 (44.9)	178 563 (69.6)	9197 (58.7)	2135 (82.1)
Specialty clinic visits (mean/year)				
<1	4 612 453 (66.4)	122 401 (47.7)	7603 (48.5)	883 (33.9)
1 to <2	1 333 481 (19.2)	65 218 (25.4)	3466 (22.1)	629 (24.2)
≥2	1 001 257 (14.4)	69 028 (26.9)	4593 (29.3)	1089 (41.9)
Primary care visits (mean/year)				
<1	3 852 024 (55.5)	102 697 (40.0)	9462 (60.4)	1229 (47.2)
1 to <2	1 195 581 (17.2)	46 554 (18.1)	2051 (13.1)	376 (14.5)
≥2	1 899 586 (27.3)	107 396 (41.9)	4149 (26.5)	996 (38.3)

including 2601 persons identified with AUD in the previous 2 years (1.0% of all persons with AUD; 80.0 per 100 000 person-years). Unadjusted and fully adjusted IRRs for suicide associated with AUD were 8.15 (95% CI 7.86–8.46) and 2.22 (95% CI 2.11–2.34) respectively (Table 2). Of these deaths, 1623 (62.4%) were reported as intentional and 978 (37.6%) as of undetermined intent. The fully adjusted IRRs for intentional death or death of undetermined intent associated with AUD were 1.74 (95% CI 1.63–1.85) and 4.65 (95% CI 4.13–5.24) respectively. In addition, AUD was associated with a >3-fold risk of non-fatal intentional injury and >1.6-fold risk of non-fatal injury of undetermined intent (Table 2, adjusted model 2).

### Healthcare utilisation prior to suicide

In the nested case-control analysis, persons with AUD were substantially more likely than controls to have had a healthcare encounter within each time interval before the index date (Table 3). For example, 39.7%, 75.6% and 93.0% of those with AUD who died by suicide had a healthcare encounter within 2 weeks, 3 months or 1 year of the index date respectively, compared with 6.3%, 25.4% and 51.8% of controls (adjusted PR and PD, <2 weeks: PR = 3.86 (95% CI 3.50–4.25), PD = 26.4 (95% CI 24.2–28.6); <3 months: PR = 2.03 (95% CI 1.94–2.12), PD = 34.9 (95% CI 32.6–37.1); <1 year: PR = 1.44 (95% CI 1.40–1.47), PD = 27.2 (95% CI 25.5–28.9)). Figure 1 shows the backward cumulative

**Table 2** Associations between alcohol use disorder and suicidal behaviours, 2002–2015, Sweden

	n (% of participants with AUD)	Unadjusted IRR (95% CI)	Adjusted model 1, <sup>a</sup> IRR (95% CI)	Adjusted model 2, <sup>b</sup> IRR (95% CI)
Completed suicide	2601 (1.0%)	8.15 (7.86–8.46)	6.20 (5.96–6.44)	2.22 (2.11–2.34)
Intentional death	1623 (0.6%)	6.07 (5.80–6.34)	4.59 (4.38–4.82)	1.74 (1.63–1.85)
Death of undetermined intent	978 (0.4%)	19.26 (17.97–20.64)	14.97 (13.86–16.17)	4.65 (4.13–5.24)
Intentional injury	2245 (0.9%)	18.01 (17.07–19.00)	18.49 (17.41–19.64)	3.18 (2.94–3.43)
Injury of undetermined intent	2595 (1.0%)	2.64 (2.54–2.75)	2.46 (2.36–2.56)	1.69 (1.61–1.77)

AUD, alcohol use disorder; IRR, incidence rate ratio.  
a. Adjusted for age, gender, marital status and education.  
b. Additionally adjusted for drug use disorders, affective disorders, anxiety/phobia disorders, psychotic disorders, personality disorders and other psychiatric disorders.

**Table 3** Prevalence of healthcare encounters among persons with alcohol use disorder and controls within specific time intervals before index date

Outcome and time interval before index date	Persons with alcohol use disorder, n (%)	Controls, n (%)	Prevalence ratio		Prevalence difference	
			Unadjusted (95% CI)	Adjusted <sup>a</sup> (95% CI)	Unadjusted (95% CI)	Adjusted <sup>a</sup> (95% CI)
Completed suicide	2601 (100.0)	26 010 (100.0)				
<2 weeks	1032 (39.7)	1635 (6.3)	6.31 (5.90–6.75)	3.86 (3.50–4.25)	33.4 (31.5–35.3)	26.4 (24.2–28.6)
<1 month	1408 (54.1)	3090 (11.9)	4.56 (4.34–4.78)	2.81 (2.62–3.01)	42.3 (40.3–44.2)	31.3 (28.9–33.6)
<3 months	1965 (75.6)	6611 (25.4)	2.97 (2.88–3.06)	2.03 (1.94–2.12)	50.1 (48.4–51.9)	34.9 (32.6–37.1)
<6 months	2219 (85.3)	9763 (37.5)	2.27 (2.22–2.32)	1.67 (1.62–1.73)	47.8 (46.3–49.3)	32.0 (30.0–34.0)
<1 year	2420 (93.0)	13 474 (51.8)	1.80 (1.77–1.82)	1.44 (1.40–1.47)	41.2 (40.1–42.4)	27.2 (25.5–28.9)
Intentional death	1623 (100.0)	16 230 (100.0)				
<2 weeks	635 (39.1)	997 (6.1)	6.37 (5.85–6.94)	3.95 (3.49–4.47)	33.0 (30.6–35.4)	26.4 (23.7–29.2)
<1 month	866 (53.4)	1900 (11.7)	4.56 (4.28–4.85)	2.86 (2.62–3.12)	41.7 (39.2–44.1)	31.4 (28.5–34.3)
<3 months	1228 (75.7)	4097 (25.2)	3.00 (2.88–3.11)	2.03 (1.92–2.14)	50.4 (48.2–52.6)	35.1 (32.3–37.9)
<6 months	1378 (84.9)	6075 (37.4)	2.27 (2.20–2.33)	1.65 (1.58–1.72)	47.5 (45.6–49.4)	31.4 (28.9–34.0)
<1 year	1504 (92.7)	8384 (51.7)	1.79 (1.76–1.83)	1.42 (1.38–1.46)	41.0 (39.5–42.5)	26.4 (24.2–28.5)
Death of undetermined intent	978 (100.0)	9780 (100.0)				
<2 weeks	397 (40.6)	638 (6.5)	6.22 (5.59–6.92)	3.76 (3.20–4.42)	34.1 (31.0–37.2)	26.6 (22.9–30.3)
<1 month	542 (55.4)	1190 (12.2)	4.55 (4.22–4.92)	2.76 (2.45–3.10)	43.3 (40.1–46.4)	31.3 (27.3–35.2)
<3 months	737 (75.4)	2514 (25.7)	2.93 (2.79–3.08)	2.02 (1.87–2.17)	49.7 (46.8–52.5)	34.7 (30.9–38.4)
<6 months	841 (86.0)	3688 (37.7)	2.28 (2.20–2.36)	1.71 (1.62–1.80)	48.3 (45.9–50.7)	33.2 (29.8–36.6)
<1 year	916 (93.7)	5090 (52.0)	1.80 (1.76–1.85)	1.48 (1.42–1.63)	41.6 (39.8–43.4)	29.0 (26.2–31.8)

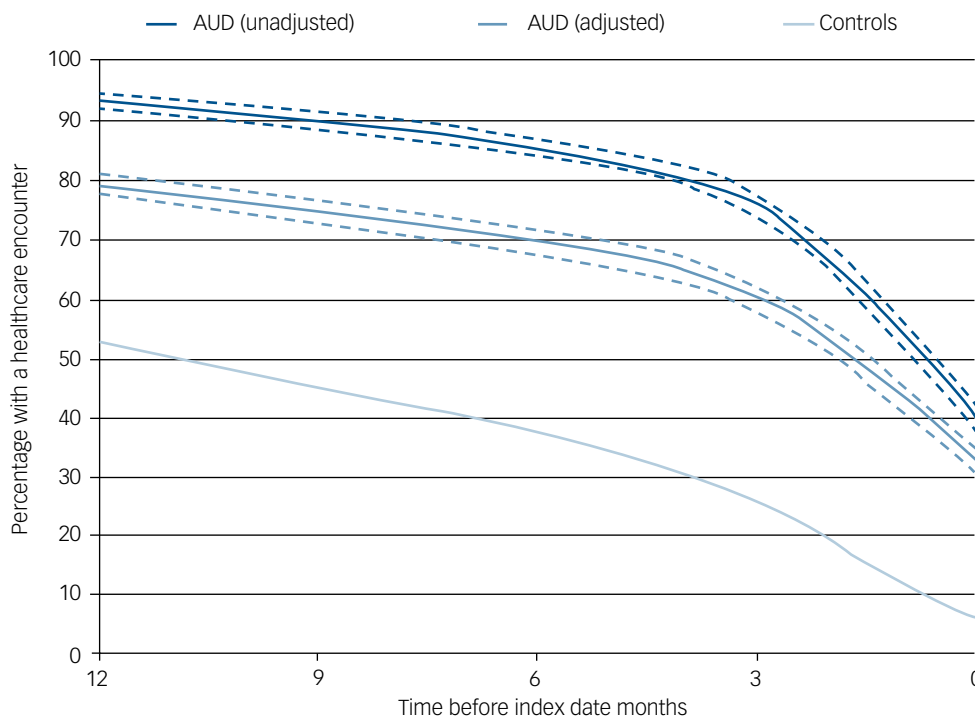
a. Adjusted for age, gender, marital status, education, drug use disorders, affective disorders, anxiety/phobia disorders, psychotic disorders, personality disorders and other psychiatric disorders. All *P* < 0.001.

prevalence (and 95% CIs) for healthcare encounters within a given time interval before the index date for persons with AUD compared with controls.

Separate analyses of intentional deaths and deaths of undetermined intent yielded very similar prevalence ratios and differences compared with analyses of these outcomes combined. For example, the adjusted PR and PD for a healthcare encounter within 2 weeks of the index date were PR = 3.95 (95% CI 3.49–4.47) and PD = 26.4 (95% CI 23.7–29.2) for intentional deaths, and PR = 3.76 (95% CI 3.20–4.42) and PD = 26.6 (95% CI 22.9–30.3) for deaths of

undetermined intent, compared with PR = 3.86 (95% CI 3.50–4.25) and PD = 26.4 (95% CI 24.2–28.6) for these deaths combined (Table 3).

Supplementary Table 1, available at <https://doi.org/10.1192/bjp.2020.122>, reports the setting and primary diagnosis for last healthcare encounters within 2 weeks or 1 year of suicide among participants with AUD. Among 1032 encounters at <2 weeks, 23.1% were hospital admissions, 28.9% were in specialty clinics and 48.1% were in primary care. Among all out-patient encounters (either specialty or primary care), the majority (55–61%) were for non-psychiatric



**Fig. 1** Backward cumulative prevalence of a healthcare encounter within a given time interval before index date among persons with alcohol use disorder compared with controls. Dashed lines show 95% CIs.



and non-injury-related medical diagnoses and <12% were for AUD. Overall similar patterns were found for last encounters within 1 year of suicide (supplementary Table 1).

A sensitivity analysis in which AUD was assessed on the basis of any lifetime history (rather than the previous 2 years) yielded slightly lower PRs but the overall conclusions were not substantially changed. For example, the fully adjusted PR for a healthcare encounter <2 weeks before suicide was 3.58 (95% CI 3.33–3.84) compared with 3.86 (95% CI 3.50–4.25) in the primary analysis, and for <1 year before suicide was 1.34 (95% CI 1.31–1.36) compared with 1.44 (95% CI 1.40–1.47) in the primary analysis.

## Interactions

Interactions were explored between AUD and gender in relation to healthcare encounters <2 weeks before the index date (supplementary Table 2). Among controls, men had a slightly lower prevalence of an encounter than women (5.7% *v.* 8.0%; adjusted PR = 0.78, 95% CI 0.71–0.87). However, comparing controls with participants with AUD, this prevalence increased from 8.0% to 44.7% among women (adjusted PR = 3.05, 95% CI 2.64–3.52) and from 5.7% to 38.1% among men (adjusted PR = 4.19, 95% CI 3.75–4.63). The relatively greater change among men resulted in significantly positive additive and multiplicative interactions (i.e. the combined effect of AUD and male gender on the likelihood of an encounter exceeded the sum or product of their separate effects;  $P = 0.01$  and  $P < 0.001$  respectively). The positive additive interaction indicates that AUD accounted for more healthcare encounters within 2 weeks of suicide among men than among women.

Interactions also were explored between AUD and age (supplementary Table 3). Among participants with AUD with a healthcare encounter <2 weeks before suicide, 12.0% were aged <35 years, 75.7% were 35–64 years and 12.3% were  $\geq 65$  years (median, 51.4 years). The prevalence of a healthcare encounter increased with age among controls (from 3.6% to 8.2%), whereas participants with AUD had a much higher overall prevalence that did not vary by age (39–40% for each group). A positive multiplicative interaction was noted between AUD and younger ages (<35 years), and a negative multiplicative interaction between AUD and older ages ( $\geq 65$  years) ( $P = 0.03$  and  $P < 0.001$  respectively). However, no additive interactions were found, suggesting that AUD accounted for similar numbers of additional encounters among younger or older adults compared with those in mid-adulthood.

## Discussion

In this large national cohort, AUD was a strong independent risk factor for completed suicide, which was often shortly preceded by healthcare encounters, especially in primary care or specialty out-patient settings. Of persons with AUD who died by suicide, 39.7%, 75.6% and 93.0% had a healthcare encounter within the previous 2 weeks, 3 months or 1 year respectively, percentages that were significantly higher than among controls. Furthermore, AUD accounted for more encounters within 2 weeks of suicide among men than women, despite fewer encounters among men in the general population. Approximately half of all encounters within 2 weeks of suicide were in primary care clinics, and the majority of those were for non-psychiatric diagnoses.

## Comparison with other research

To our knowledge, this is the first study to examine healthcare utilisation patterns prior to suicide in persons with AUD in a large population-based cohort. A US study of 3132 male military veterans with any substance use disorders reported that 25.4%, 55.6% and

75.9% had a healthcare encounter within 7, 30 or 90 days of suicide, but did not include a comparison group or assess this separately in those with AUD.<sup>17</sup> Other studies have explored healthcare utilisation more broadly in general populations. The largest of those include a Danish study of 11 191 persons who died by suicide and 55 955 controls, which reported that 83% and 32% had a primary care encounter within 1 year or 1 month of the index date respectively, compared with 76% and 19% among controls.<sup>11</sup> A South Korean study of 11 523 persons who died by suicide also reported high prevalences of healthcare utilisation (81% in men, 91% in women) within 1 year of suicide, and increasing frequency during the final 3 months.<sup>13</sup> A US study of 5894 persons who died by suicide reported that 83% received healthcare in the previous 1 year, and 55% did not have a psychiatric diagnosis.<sup>12</sup> A UK chart review study of 247 primary care patients who died by suicide also reported significant heterogeneity in healthcare utilisation across different psychiatric disorders.<sup>14</sup> However, these patterns have not previously been examined specifically in patients with AUD.

These patterns are clinically important because of the high prevalence of AUD and its known suicide risks. AUD is among the most common mental disorders, with an estimated worldwide prevalence of 5%, and even higher in high-income (8.4%, 95% CI 8.0–8.9) or upper-middle-income (5.4%, 95% CI 5.0–6.0) countries.<sup>1–3</sup> AUD is also one of the strongest reported risk factors for suicidal behaviour.<sup>4–9</sup> A meta-analysis of 33 cohort studies reported nearly 10-fold risks of completed suicide in adult men and women with AUD compared with the general population (standardised mortality ratio, 979, 95% CI 898–1065).<sup>7</sup> A more recent meta-analysis of 31 studies with 420 732 participants reported pooled odds ratios of 3.13 (95% CI 2.45–3.81) for suicide attempt and 2.59 (95% CI 1.95–3.23) for completed suicide associated with AUD.<sup>4</sup> A Swedish cohort study of 7.1 million adults who overlapped with the present cohort found >4-fold risks of completed suicide associated with AUD in either men or women, even after adjusting for depression, other psychiatric disorders and somatic disorders.<sup>9</sup>

In the present study, persons with AUD had more than a three-fold higher prevalence of healthcare encounters <2 weeks before suicide compared with the background prevalence. Furthermore, AUD accounted for more such encounters among men, and similar numbers among younger or older adults compared with those in mid-adulthood. Most of these encounters were for non-psychiatric diagnoses. These findings provide further evidence to support universal screening of patients for suicidality and its major risk factors, including depression and AUD. Prior studies have shown that clinical interventions to prevent suicide are effective but remain underutilised.<sup>25,26</sup> Brief screening for depression, AUD and suicidality is clinically feasible, effective and can be administered by medical assistants.<sup>27–31</sup> Positive screens should trigger further discussion with the clinician and prompt psychiatric follow-up.<sup>32</sup> Healthcare settings that lack a system to follow up positive screens should prioritise the development of such a system to provide effective care for mental health and suicidality.<sup>33</sup>


## Strengths and limitations

A key strength of the present study was the ability to examine healthcare utilisation patterns using nationwide in-patient and out-patient (including both specialty and primary care) data. This design minimises potential selection or ascertainment biases, enabling more robust estimates based on a national population. AUD was ascertained using not only nationwide diagnoses but also alcohol-related convictions, thus improving ascertainment with data that are independent of the healthcare system. The results were controlled for sociodemographic factors and other psychiatric disorders, which also were ascertained using highly complete nationwide data.

This study also had several limitations. First, although it included primary care encounters, they were not available with complete nationwide coverage. The Swedish Primary Care Registry had approximately 45% coverage of the national population in 2001, which increased to 75% by 2008 and onward.<sup>20</sup> Primary care encounters are therefore underreported in the present study and their estimated proportion of all encounters should be considered a lower bound. Second, as in other population-based studies, the reporting of suicides involves some misclassification. However, available data on intentional deaths as well as deaths of undetermined intent enabled separate analyses of these outcomes, which showed little difference in healthcare utilisation patterns. Third, generalisability to other populations with different socioeconomic contexts and healthcare systems is uncertain. These findings will need replication when possible in other countries and diverse populations.

### Clinical implication

Improved uptake of screening and treatment interventions in primary care and specialty out-patient settings is a high priority for suicide prevention among persons with AUD.

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### Supplementary material

Supplementary material is available online at <https://doi.org/10.1192/bjp.2020.122>.

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### Data availability

The national registry data on which this study was based were analysed under strict confidentiality agreements with Swedish authorities. For ethical and legal reasons, the supporting data (which come from a large portion of the Swedish population) cannot be made openly available. Further information about the data registries is available from the Swedish National Board of Health and Welfare: <https://www.socialstyrelsen.se/en/statistics-and-data/registers/>.

### Author contributions

J.S. had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis; study concept and design: all authors; acquisition of data: J.S., K.S.; analysis and interpretation of data: all authors; drafting of the manuscript: C.C.; critical revision of the manuscript for important intellectual content: all authors; statistical analysis: C.C., J.S.; obtained funding: all authors; approval of the final version to be published: all authors.

### Declaration of interest

None.

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## References

- World Health Organization. *Global Status Report on Alcohol and Health 2018*. WHO, 2018.
- Rehm J, Shield KD. Global burden of disease and the impact of mental and addictive disorders. *Curr Psychiatry Rep* 2019; **21**(2): 10.
- Carvalho AF, Heilig M, Perez A, Probst C, Rehm J. Alcohol use disorders. *Lancet* 2019; **394**: 781–92.
- Darvishi N, Farhadi M, Haghtalab T, Poorolajal J. Alcohol-related risk of suicidal ideation, suicide attempt, and completed suicide: a meta-analysis. *PLoS One* 2015; **10**(5): e0126870.
- Norstrom T, Rossow I. Alcohol consumption as a risk factor for suicidal behavior: a systematic review of associations at the individual and at the population level. *Arch Suicide Res* 2016; **20**: 489–506.
- Borges G, Loera CR. Alcohol and drug use in suicidal behaviour. *Curr Opin Psychiatry* 2010; **23**: 195–204.
- Wilcox HC, Conner KR, Caine ED. Association of alcohol and drug use disorders and completed suicide: an empirical review of cohort studies. *Drug Alcohol Depend* 2004; **76**(suppl): S11–9.
- Reutfors J, Brandt L, Ekbohm A, Isacson G, Sparen P, Osby U. Suicide and hospitalization for mental disorders in Sweden: a population-based case-control study. *J Psychiatr Res* 2010; **44**: 741–7.
- Crump C, Sundquist K, Sundquist J, Winkleby MA. Sociodemographic, psychiatric and somatic risk factors for suicide: a Swedish national cohort study. *Psychol Med* 2014; **44**: 279–89.
- World Health Organization. *Global Status Report on Alcohol and Health 2014*. WHO, 2014.
- Pedersen HS, Fenger-Gron M, Bech BH, Erlangsen A, Vestergaard M. Frequency of health care utilization in the year prior to completed suicide: A Danish nationwide matched comparative study. *PLoS One* 2019; **14**(3): e0214605.
- Ahmedani BK, Simon GE, Stewart C, Beck A, Waitzfelder BE, Rossow R, et al. Health care contacts in the year before suicide death. *J Gen Intern Med* 2014; **29**: 870–7.
- Cho J, Kang DR, Moon KT, Suh M, Ha KH, Kim C, et al. Age and gender differences in medical care utilization prior to suicide. *J Affect Disord* 2013; **146**: 181–8.
- Pearson A, Saini P, Da Cruz D, Miles C, While D, Swinson N, et al. Primary care contact prior to suicide in individuals with mental illness. *Br J Gen Pract* 2009; **59**: 825–32.
- Andersen UA, Andersen M, Rosholm JU, Gram LF. Contacts to the health care system prior to suicide: a comprehensive analysis using registers for general and psychiatric hospital admissions, contacts to general practitioners and practising specialists and drug prescriptions. *Acta Psychiatr Scand* 2000; **102**: 126–34.
- Hochman E, Shelef L, Mann JJ, Portugese S, Krivoy A, Shoval G, et al. Primary health care utilization prior to suicide: a retrospective case-control study among active-duty military personnel. *J Clin Psychiatry* 2014; **75**: e817–23.
- Ilgel MA, Conner KR, Roeder KM, Blow FC, Austin K, Valenstein M. Patterns of treatment utilization before suicide among male veterans with substance use disorders. *Am J Public Health* 2012; **102**(suppl 1): S88–92.
- Ludvigsson JF, Almqvist C, Bonamy AK, Ljung R, Michaelsson K, Neovius M, et al. Registers of the Swedish total population and their use in medical research. *Eur J Epidemiol* 2016; **31**: 125–36.
- Ludvigsson JF, Andersson E, Ekbohm A, Feychting M, Kim JL, Reuterwall C, et al. External review and validation of the Swedish national inpatient register. *BMC Public Health* 2011; **11**: 450.
- Sundquist J, Ohlsson H, Sundquist K, Kendler KS. Common adult psychiatric disorders in Swedish primary care where most mental health patients are treated. *BMC Psychiatry* 2017; **17**(1): 235.
- Ohberg A, Lonnqvist J. Suicides hidden among undetermined deaths. *Acta Psychiatr Scand* 1998; **98**: 214–8.
- Bjorkenstam C, Johansson LA, Nordstrom P, Thiblin I, Fugelstad A, Hallqvist J, et al. Suicide or undetermined intent? A register-based study of signs of misclassification. *Popul Health Metr* 2014; **12**: 11.
- Lindqvist P, Gustafsson L. Suicide classification: clues and their use. a study of 122 cases of suicide and undetermined manner of death. *Forensic Sci Int* 2002; **128**: 136–40.
- Allebeck P, Allgulander C, Henningsohn L, Jakobsson SW. Causes of death in a cohort of 50,465 young men—validity of recorded suicide as underlying cause of death. *Scand J Soc Med* 1991; **19**: 242–7.
- Hofstra E, van Nieuwenhuizen C, Bakker M, Ozgul D, Elfeddali I, de Jong SJ, et al. Effectiveness of suicide prevention interventions: a systematic review and meta-analysis. *Gen Hosp Psychiatry* 2020; **63**: 127–40.

- 26 Mann JJ, Apter A, Bertolote J, Beautrais A, Currier D, Haas A, et al. Suicide prevention strategies: a systematic review. *JAMA* 2005; **294**: 2064–74.
- 27 Posner K, Brown GK, Stanley B, Brent DA, Yershova KV, Oquendo MA, et al. The Columbia-Suicide Severity Rating Scale: initial validity and internal consistency findings from three multisite studies with adolescents and adults. *Am J Psychiatry* 2011; **168**: 1266–77.
- 28 Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* 2001; **16**: 606–13.
- 29 Reiss-Brennan B, Briot P, Cannon W, James B. Mental health integration: rethinking practitioner roles in the treatment of depression: the specialist, primary care physicians, and the practice nurse. *Ethn Dis* 2006; **16**(suppl 3): S3–43.
- 30 Madras BK, Compton WM, Avula D, Stegbauer T, Stein JB, Clark HW. Screening, brief interventions, referral to treatment (SBIRT) for illicit drug and alcohol use at multiple healthcare sites: comparison at intake and 6 months later. *Drug Alcohol Depend* 2009; **99**: 280–95.
- 31 Babor TF, Del Boca F, Bray JW. Screening, brief intervention and referral to treatment: implications of SAMHSA's SBIRT initiative for substance abuse policy and practice. *Addiction* 2017; **112**(suppl 2): 110–7.
- 32 Bauer AM, Chan YF, Huang H, Vannoy S, Unutzer J. Characteristics, management, and depression outcomes of primary care patients who endorse thoughts of death or suicide on the PHQ-9. *J Gen Intern Med* 2013; **28**: 363–9.
- 33 Coffey CE. Building a system of perfect depression care in behavioral health. *Jt Comm J Qual Patient Saf* 2007; **33**: 193–9.



## psychiatry in literature

### St Bartholomew's: a 12th-century clinical case series; and, a young man, Robert by name, 'his witte was recoueryd'

Greg Wilkinson

Bartholomew the apostle was skinned alive and beheaded – according to legend. Miracles were attributed to him and he became associated with medicine and hospitals. The report of Robert's case, from the shrine of St Bartholomew in Smithfield, is preserved in a manuscript in two versions, one in Latin (c.1180) and the other in Middle English (c.1400). *The Book of the Foundation of St. Bartholomew's Church in London* was edited from the original by Moore (1923), to the memory of the founder in 1123 of St Bartholomew's church and hospital, Rahere, who himself is fabled to have recovered miraculously from fever. Wilmer & Scannon (1954) count 57 examples, children and adults, 22 neuropsychiatric in nature. Beyond psychiatric phenomena, the text brings to life medieval romantic and religious motifs in comprehensible prose:

'A Certeyne yonge [man] cumly [handsome] of persone, Robert by name / from his yonge age norysshid [brought up] yn courte, from Northampton purposid to Londone / And it happid hym / thorow a thyke woode to make his passage / where he, wery of his iorney / toke his reste / one the grownd, and a while with a litill slepe recreate [refresh] hym / that, his way begone / the swyfterly he might parforme / but loo, whyle he sowghte reest / he fownde labur, and whan he wolde with a litill reest his wery lymys refresshe, he was yntanglyd with the snarys of his ennemy [the devil]. In his slepe his olde ennemy aperid to hym / yn the forme of a right fair womane / the wichie with flaterynge chere it semyd to haue sitte at his hede; And whan, with flaterynge blandysh / A goodwhyly she hadde flateryd hym / And smothid hym / she put a litill bird yn to his moweth, And so aperid no more / the man awakid, was afrayed of this vrwount vision / and the same houre he lost his wytte / and resoun [reason] of all myght [capacity] was priuate [deprived] / and what was for to be done / or lefte, he knew nat / ledynge hym woidenes [agitated] / nowe this way / now that way / he wanderid rennyng / vnknowynge what he did / hastily he went whedyr the ympetuoussnes of the malicious woodenes [madness] ympellid hym / At the last he was takyne at Londone, And brought to the chirche of seynt Barthilmewes / And ther yn shorte space his witte was recoueryd; where a litill tyme he taried / blessyng God, that to his Apostles hath vouchesaf to commytte his excellent power / to hele syke / to clense lepers / and to caste owte feendys.'

Robert and his fellow patients were all received at the shrine or hospital. Most experienced 'miraculous' relief. Some remained as in-patients for a time or recovered over a period with contemporaneous local care – as they still do today.

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