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Title:

Hospital discharge location and socioeconomic deprivation as risk factors for alcohol dependence relapses: a cohort study.

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Abstract:

Background: There is evidence that social support can improve the ability of an individual with alcohol use disorder to manage relapses. However, the role of families and friends in this context is debated as family history and co-drinking are also risk factors for initiating alcohol drinking or maintaining addictive behaviours. **Aim:** To quantitatively evaluate whether the hospital discharge location (in company or alone) after an alcohol dependence hospitalisation can influence the risk of relapses and whether this impact is modified by socioeconomic deprivation. **Methods:** A cohort of 1,141 patients hospitalised for the first time for alcohol dependence in Scotland between 2010 and 2019 was derived from a routine healthcare database. Relapses were defined as recurrent alcohol-related hospitalisation. Survival analysis was undertaken to compare the risk of relapse for different discharge locations and socioeconomic deprivation groups. **Results:** On average, living in company of others was associated with a significant lower risk of relapses compared to living alone (HR: 0.84 95%CI: 0.71-0.99). This association differed across socioeconomic groups, being greater for those living in areas with the highest level of socioeconomic deprivation (HR: 0.76 95%CI: 0.57-1.01) and lower elsewhere. While this effect was not statistically significant ($p=0.056$), its extent varied based on how we defined our cohort: it was not detectable when we expanded the cohort to all individuals with alcohol use disorders. **Conclusions:** Home settings and the environment where individuals reside should be considered as significant psychosocial factors when clinicians design therapies and hospital discharge planning for patients with alcohol dependence.

Keywords:

alcohol dependence; socioeconomic deprivation; Scotland; social support; risk factor; relapse.

1. Introduction

In 2018, the National Health System (NHS) estimated the prevalence of alcohol dependence among the adult population of England to lie between 1.1% and 1.7%[1]. A recent systematic review suggests that incidence of alcohol dependence among hospitalised patients is even higher at 10.3%[2]. These figures are likely to be greater in Scotland, where alcohol consumption and alcohol-related morbidity and mortality are higher than England and Wales [3]. In particular, this represents a significant burden for the NHS, where in 2018/19 in Scottish hospitals, it was estimated that 669 hospitalisations (regarding 557 patients) per 100,000 inhabitants were alcohol related[4].

When alcohol use disorders (AUDs) are widespread within the society, social relations and the environment where individuals live can influence the risk and shape the attitudes towards substance abuse and dependence[5]. Families have a dominant role in this as they represent the main social institution, especially for young adults [6]. Relating to AUDs, family history and co-drinking are among the main risk factors for initiating to drinking alcohol[7]. Evidence supports the hypothesis that interpersonal dynamics within families are one of the main causes of alcoholism as they support and maintain addictive behaviours and compromise the patient's ability to cope[8]. However, the role of the family in alcohol addiction or abuse is controversial. While family members can be a source of initiating, they can be equally important in managing the disorder as they can be conceived as an informal unit of treatment and a source of support [9]. Apart from families, other social interaction such as friendships and the social environment where an individual lives can play a crucial role in influencing drinking attitudes [10].

Psychosocial factors are also relevant in episodes of alcohol dependence relapses[11]. Specifically, it has been shown that 'social support', defined as the help from nearby people[12], can reduce the risk of relapses[13]. However, other studies found that the presence of families and friends can be correlated with a return to drink[14]. Different scales (e.g. High Risk Alcoholism Relapse[15] and the Alcohol Relapse Risk Assessment[16]) have been developed to calculate the likelihood of relapses in alcohol disorders. However, such scales have not always been validated by scientific studies[16], and do not always take into account the patient's social context and social support. The most recognised predictors of alcohol dependence relapse include comorbid psychiatric conditions, social support, tobacco use[17], past alcohol intake and a number of lifetime symptoms[18]. Although it has been acknowledged that social support and social context can play a crucial role in the drinking behaviour of an individual, the contribution of specific living settings (such as living solo or in private accommodation in company of others or living in institutions such as care homes) to alcohol dependence relapses has not been extensively studied. The general risk of relapsing for alcohol dependent individuals has been assessed to be high (70%) within the first 6 months after receiving treatments and then the risk decreases over time[19]. Therefore, patient's psychosocial context just after or during alcohol dependence treatment is essential, as the individual is in a vulnerable period where the risks of relapses are greater.

Moreover, the extent and perception of social support can vary across deprived groups[20], with consequences on the ability to cope with dependence and relapses.

In particular, neighbourhood socioeconomic status[21] and individual socioeconomic resources[22] through social support can affect the ability to recover from AUD.

The aim of this study was to quantitatively evaluate whether different living settings after an episode of alcohol dependence, represented by hospital discharge locations, can influence the risk of relapses. In addition, it was evaluated whether any such association differed across levels of socioeconomic deprivation.

2. Methods

2.1 The study cohort

Individuals who were hospitalised for alcohol use disorders between January 2010 and March 2019 were identified from Scottish Morbidity Records (General/Acute Inpatient and Day Case)[23]. This cohort was linked with their prescriptions reimbursed in the community using record linkage of prescribing national datasets from Scotland [24].

The cohort under study included 2,074 patients who had their first hospitalisation in the last 10 years for alcohol dependence coded as the primary diagnosis of hospitalisation after 1 January 2010. Diagnoses are recorded using the International Statistical Classification of Diseases and Related Health Problems 10th version (ICD10 codes[25]). The ICD10 code identifying alcohol dependence syndrome is F10.2.

Relapses were defined as a further hospitalisation for any AUD (harmful use, intoxication, withdrawal, dependence, other or unspecified reflecting the ICD10 codes from F10.0 to F10.9) coded as main cause of hospitalisation.

2.2 Hospital discharge location

The national dataset contains a variable which identified the location to which the patient was discharged. For the complete distribution of discharge locations in the cohort see supplementary material. Whenever discharge place was coded as 'no detail added' data was treated as missing. Given the multitude of discharge location in the cohort, to get enough statistical power for the analysis, only the discharge locations with more than 100 patients were considered. This included two discharge locations which were compared with each other to determine the different risk of relapses in individuals after their first hospitalisation for alcohol dependence. The two locations were: 'discharged at private residence alone' and 'discharged at private residence with family or friends'. Out of the 2,074 individuals with hospitalisation for alcohol dependence, 1,912 were discharged at private residences, and only 1,174 of them had complete data. Out of these, 1,141 (97%) individuals belonged to one of the two discharge locations (Figure 1 and Table 1).

A total of 1,141 individuals with alcohol dependence hospitalisation and discharged to a private residence were included in the study. Of them, 594 individuals were discharged at private residence alone and 547 discharged in company of others (friends or family).

We measured levels of comorbidities to adjust for important differences between the two groups. Comorbidities were obtained from hospital records of the past 10 years. On average, baseline demographic characteristics and hospital history did not differ significantly between the two groups (Table 1). However, minor dissimilarities could be observed in the rate of previous hospitalisation for other AUD (6% difference between the two groups). The dataset also contained the patients' quintiles of the Scottish Index

of multiple deprivation (SIMD), an area-based measure of socioeconomic deprivation where 1 is the most deprived fifth of areas and 5 is the least deprived fifth of areas [26].

[Figure 1]

Figure 1. Cohort identification

Table 1 Demographic and other non-survival cohort characteristics.

[Table1]

CCI= Charlson Comorbidity Index, AUD=Alcohol Use Disorder, SIMD= Scottish Index of Multiple Deprivation

2.3 Analysis

Descriptive statistics regarding number of events, and median time at risk were produced. To adjust for confounding, propensity score analysis (i.e. inverse probability weighting) was performed to account for differences in baseline characteristics between groups. Variables included into the propensity score were: sex, age, Charlson comorbidity index, specific relevant comorbidities (mental health, other AUD different than dependence and recreational drugs) and health board location. Cox regression models were used to estimate the relationship between risk of relapses and discharge location first, and then the combined effect of discharge location with socioeconomic deprivation. To fully assess the risk of relapse, we used Kaplan Meier survival plots and statistics to estimate the time to first relapse. Stratification in the model based on the length of hospitalisation was used to maintain proportional hazards between groups. The proportional hazard assumption was checked with Schoenfeld Residuals test[27]. The final Cox model was selected based on information criteria, Schoenfeld Residuals test and the comparison between survival and Kaplan Meier curves. The only variable with missing information was 'discharge location' and for the base case analysis, complete case analysis was used..

2.4 Sensitivity analysis

The analysis was also run using a restricted definition of relapses, which looked only at further hospitalisations caused by alcohol dependence without including all other alcohol related hospitalisations. To examine whether missing information on discharge locations could have affected the analysis, a sensitivity analysis was performed using multiple imputation. To consider possible issues related to the clinical coding, to increase the sample size and to assess the effect of living in company on other alcohol related diagnoses, an additional sensitivity analysis using a larger cohort including all patients with a first hospitalisation for any alcohol related cause (all F10.x) was undertaken.

3. Results

[Figure 2]

Figure 2. Kaplan Meier curves of time to alcohol-related relapse by discharge location.

Table 1. Survival descriptive characteristics by discharge setting and Socioeconomic deprivation quintile.

[Table 2]

SIMD= Scottish Index of Multiple Deprivation

3.1 Time at risk and descriptive statistics by cohorts

Kaplan Meier curves and median time at risk shows that, on average, the time taken to experience the first relapse is longer if individuals were discharge in company rather than alone (Figure 2 and Table 2). Regarding the socioeconomic deprivation area and the discharge site, it is worth noting how patients living in the most and the least deprived socioeconomic areas have the same relative number of relapses (58%) and the lowest median time at risk (391 and 251 days, respectively). In contrast, the middle quintiles were more similar to each other with longer median time at risk and fewer relapses.

3.2 Modelling Results

When considering any further hospitalisations related to alcohol as a relapse, the residence environment on average affected the risk of relapses: living in company of others was associated with a significant lower risk of relapses (HR: 0.84 95%CI: 0.71-0.99). In addition, the level of socioeconomic deprivation was correlated with relapses as well. Specifically, residing in the most deprived socioeconomic quintile significantly increased the risk of relapses compared to middle quintiles, reaching its maximum in comparison to the fourth quintile (HR: 0.69 95%CI: 0.52-0.91).

Looking at the interaction between socioeconomic deprivation status and the home discharge location, individuals residing in the most deprived areas and living in company had lower risk of relapses compared to other groups (HR: 0.76 95%CI: 0.57-1.01). There was some evidence that the effect of being discharged in company varied across socioeconomic deprivation groups, being associated with a lower risk of relapses in the least deprived areas, until being associated with an increase in the risk of relapses of 119% for the least deprived group (HR: 2.19 95%CI: 0.85-5.61.30) (see supplementary material for Cox model with the interaction term using least deprived group as reference). Although the direction of these interaction effects seems relevant, they both did not meet the conventional level of statistical significance ($p < 0.05$).

Table 2. Cox regression output for any further hospitalisation related to AUD.

[Table 3]

AUD=Alcohol use disorder, SIMD= Scottish Index of Multiple Deprivation

3.3 Sensitivity analysis

The Cox regression based on the restricted definition of relapse (defined as a further hospitalisation for alcohol dependence -ICD 10 code: F10.2- without including all AUD) showed that being discharged at home in company was statistically significantly associated with a lower risk of relapse at a 95% level of confidence (HR: 0.74 95%CI: 0.59-0.94). Regarding the interaction between socioeconomic deprivation status and the discharge locations, living in company and in the most socioeconomically deprived quintile and in company in the least deprived quintile influenced the risk of relapses for alcohol dependence in opposite directions. However, alike for the main analysis, both factors were not statistically significant.

The sensitivity analysis regarding the imputation methods confirms the same patterns of the complete case analyses. The decrease in risk of relapse due to living in company was 20% (HR: 0.80 95%CI: 0.67-0.94). Also, there was the increase in risk of relapse due to living in both the most and least deprived quintiles, with living in the least having a higher magnitude effect. Patients in the least deprived areas had less gains from living in company compared to those in the most deprived groups .

Including all individuals with a first hospitalisation for any alcohol related hospitalisation increases the cohort size to 12,605 individuals being discharged at private residence alone or in company. The analysis recorded a higher overall effect on being discharged in company (HR: 0.78 95% CI: 0.73-0.84). Only the most deprived group had a significant effect in the interaction term between socioeconomic deprivation and being discharged in company. In contrast with the main analysis, there was not any evidence of an overall differential effect across deprivation groups. See supplementary material for sensitivity analysis outputs.

4. Discussion

This study demonstrated that the discharge location after being hospitalised for alcohol dependence for the first time is associated with the risk of being re-hospitalised for relapses. In particular, the study found that living in company of other people in the period immediately following a hospitalisation for alcohol dependence is significantly associated with a drop in the risk of relapse by 16% compared to being discharged alone. This effect differs across socioeconomic groups, being more significant for people residing in most deprived socioeconomic quintiles.

This analysis cannot be interpreted as causal inference, but as an association and correlation between location setting and socioeconomic deprivation with the risk of alcohol dependence relapses. This is mainly because variables found to be relevant in previous literature to determine risk of relapses were not available in the dataset (e.g. attendance to psychological therapies or community rehabilitation programmes, AUD family history and others [17, 18]). Therefore, we believe that the effect of the home setting can be interpreted as a proxy for a number of different factors such as AUD family history, peer pressure, peer support during therapy, stigma, etc. These factors can influence positively or negatively the individuals in their recovery journey after hospitalisations[28-30]. Whenever positive factors outweigh the negative, individuals should be less at risk of relapses. This study shows that on average, living in company of others after being hospitalised for alcohol dependence has more positive factors than negative, with a consequent reduction of the risk of relapses.

It is worth noting how the least socioeconomic deprived quintile is associated with a greater risk of relapses compared to the others (yet, this effect did not meet conventional level of statistical significance). Although it is less common that people living in the least deprived areas are hospitalised for alcohol dependence, these individuals are more likely to have earlier relapses compared to the rest of the population (Table 2). The combined effect shows how the effect of the discharge location on the risk of having relapses changes across deprivation areas. In particular, the positive effects of living in company seem to be stronger in reducing the risk of relapses in more deprived areas and declining in wealthier groups, until being associated with a (non-significant) counterproductive effect of increasing the risk of relapse in the least deprived quintile of 119%. While these effects may be related to the specific cohort coded with alcohol dependence (the sensitivity analysis on a larger cohort on all AUD diagnosis did not find such outcomes), there may be several reasons why such relationship could exist.

As the dependence and drinking dynamics can differ across deprivation groups[31], it seems reasonable that diverse socioeconomic areas have different influence on the effect that certain discharge location can have. Whilst this peculiar effect of discharge locations on the least socioeconomic deprived group is difficult to explain, there could be multiple explanations for different general results across socioeconomic groups. Firstly, people living in the wealthiest areas could have easier access to care and psychological support [32] and higher health care quality [33] compared to those in more deprived locations, making them less likely to have the first unplanned hospitalisation. This would reduce the number of individuals being hospitalised with alcohol dependence hospitalisations living in the wealthiest areas, making the remaining people getting hospitalised a “self-selected” more severe sample and therefore more likely to have relapses. In confirmation, Table 2 shows that people living in the wealthiest group are the least represented in the cohort but, at the same time they are more likely to be re-hospitalised, and when they are, they are subject to the highest risk of rehospitalisation. Secondly, these results could be affected by a low sample size in the least deprived group. Thirdly, conclusions could be biased by omitted variables (such as receiving cognitive behavioural therapies or other psychological treatment) which could act differently across deprivation groups [34, 35].

Creating a stricter definition of relapses did not change the direction coefficient of the variables, however, variables had lower statistical significance in the interaction. This could be justified by a lower statistical power in the survival regression given by fewer relapses. Missing data were initially supposed to be ‘missing completely at random’ as the cohort was extracted from an administrative dataset. Multiple imputation did not change coefficient substantially and confirmed our initial hypothesis.

Including all individuals with alcohol related hospitalisation, enlarged the cohort but at the same time included patients with less severe or different AUD diagnosis. While this confirmed the effect of lower risk of relapses if discharged in company (the effect was even greater), it did not find any difference of this effect across areas with different levels of socioeconomic deprivation. This suggests that our conclusions on the overall effect of being discharged in company are valid across all AUD hospitalisations. However, the effect of the level of socioeconomic deprivation itself and its link with being discharged in company vs solo seems to depend on the specific AUD diagnosis. A possible explanation is that individuals suffering from alcohol dependence and living in the most deprived areas, having a more severe substance abuse disorder, benefit more from the company found in the discharge location place than the rest of AUD patients. However, we are aware that the precision of the diagnosis at the hospital has a key role in this interpretation. Further complementary qualitative and quantitative data from GP practices across different areas could shed light on this.

We feel that the main strengths of this research are the use of a large national dataset and the useful insights of the associations between risk of relapses and social environment, and how these relationships can change across different social-economic areas. Specifically, living with family or friends is a factor which decreases the risk of alcohol dependence relapses. This factor was more significant if patients live in the most deprived areas. However, there were also several limitations to our study.

4.1 Limitations

Firstly, the study uses observational data, so the internal validity of the findings is more of a concern. To deal with the potential biases due to confounding by indication, the analysis employed propensity score techniques (IPTW) with characteristics prior to the

first hospitalisation. However, demographic characteristics did not differ significantly across different treatment groups.

Secondly, the use of administrative hospital data allowed us to assess only dependence or relapse events through records of hospitalisations. However, only a proportion of individuals suffering from alcohol dependence end up being hospitalised as sometimes other care institutions may be contacted. This could have limited our analysis only to the most severe cases of alcohol dependence.

Thirdly, our dataset was limited to hospitalisations and prescriptions. It excluded all other sources of likely and possible care for patients suffering by AUD such as cognitive behavioural therapy, community alcohol withdrawal or self-help groups like Alcoholics Anonymous. As mentioned, these services can be an alternative source of care for individuals with alcohol dependence. The absence of such care sources in our dataset could be conceived as an omitted variable. However, despite the benefit of starting treatments during hospitalisations and supported discharge[36, 37], hospitals usually limit their action to detoxifying patients without addressing their substance use disorders after staying at the hospital[37]. This is particularly true for unplanned hospitalisation such as admission through emergency departments [36] which are over utilised by AUD patients[38, 39]. Consequently, patients are not typically referred to alternative recovery and rehabilitation agencies after hospitalisations. Therefore, patients' social support (i.e. peers, family or neighbours) could influence help-seeking behaviour and have a key role in the patient's recovery journey. Thus, individual patients' datasets linked to these complementary but central sources of care would shed light on this mechanism, clarifying further the role of different social supports and contexts in the journey of patients suffering from alcohol dependence.

As already mentioned, additional limitations can be related to the quality of clinical coding of the patients during hospital admission. Despite the clarity of ICD-10 coding guidelines for Scotland regarding alcohol excess and alcohol related conditions[40], there could be discrepancies in clinicians' judgment in identifying sub categories of alcohol related diagnoses (e.g. differences between dependence and withdrawal). However, the large sample size representative at a national level should attenuate the potential bias coming from this. Also, our data only captures where patients are discharged to, yet there was no information on how long they remained in that location. Given the high rate of relapse in the immediate period after the first AUD episode[19], we believe that the importance of the environment right away after hospital discharge is crucial, even if patients do not remain in the same place for all their recovery journey.

Furthermore, these results come from a Scottish dataset representative at a national level and the real-world context strengthens the external validity of the study. However, we are conscious that Scottish alcohol drinking habits can be different and higher than other countries. This could make results on specific deprived groups difficult to generalise to populations having dissimilar alcohol habits and epidemiology.

5. Conclusion

This study showed that social supports, especially the home setting after a hospitalisation together with the area where individuals live, are associated with the risk of relapses in alcohol dependent patients. Being discharged in company is associated with a lower risk in relapses. This effect was more significant in more

deprived areas. Given these results, clinicians should consider important psychosocial factors, including home settings and discharge locations, of patients when designing their therapy.

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Figure 1

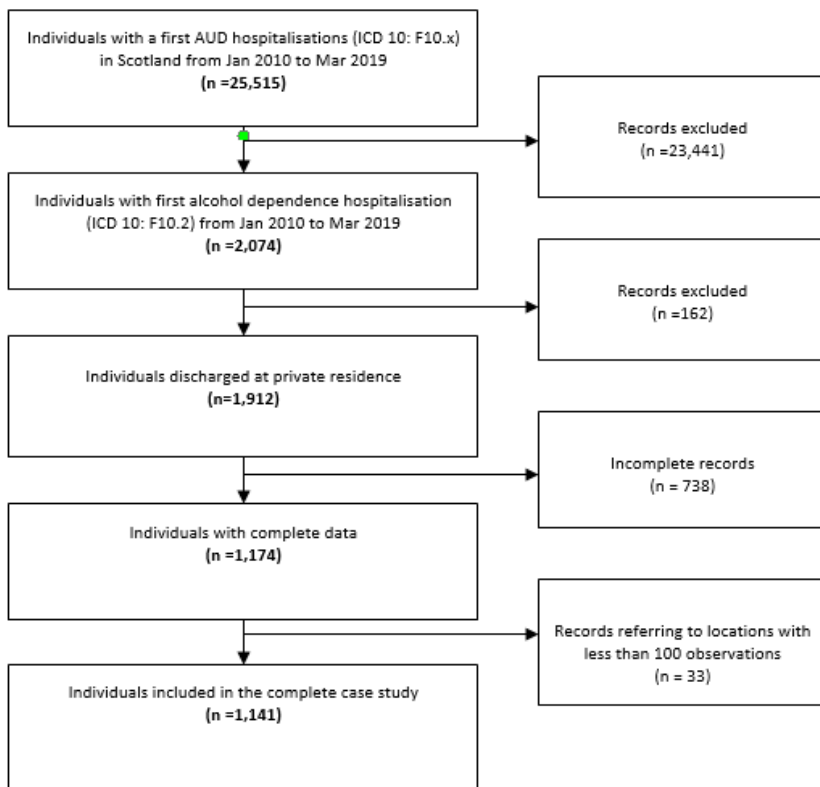


Figure 2

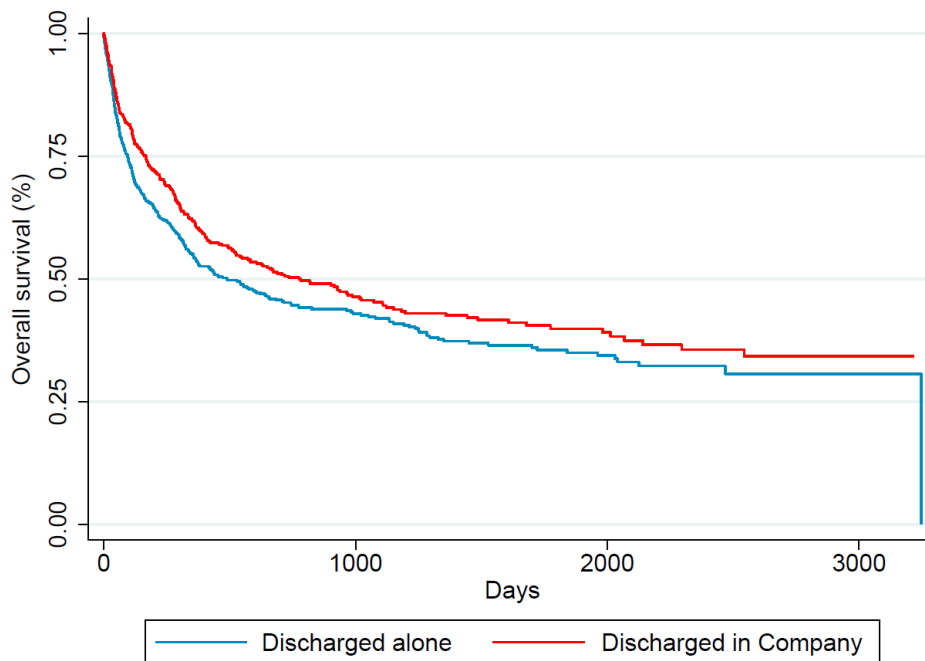


Table 1 Demographic and other non-survival cohort characteristics.

	Discharged at private residence alone n=594	Discharged at private residence with friends or family n=547
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Male	438 (73.4%)	366 (66.9%)
Age, years - mean (SD)	53.4 (13.20)	51.1 (13.91)
Hospitalisation length - mean (SD)	6.73 (12.37)	5.87 (10.41)
SIMD (quintiles) (%)		
1 (most deprived)	191 (32.2%)	173 (31.6%)
2	173 (29.1%)	125 (22.9%)
3	139 (23.4%)	141 (25.8%)
4	75 (12.6%)	78 (14.3%)
5 (least deprived)	16 (2.7%)	30 (5.5%)
Individuals with previous hospitalisation for:		
Depression or anxiety	169 (28.4%)	142 (26.0%)
AUD (different than dependence)	497 (83.7%)	424 (77.5%)
Recreational drugs	158 (26.6%)	131 (23.9%)
10yrs CCI		
0	300 (50.5%)	290 (53.0%)
1-2	221 (37.2%)	190 (34.7%)
3-4	50 (8.4%)	36 (6.6%)
>4	23 (3.9%)	31 (5.7%)
Individuals with prescriptions after hospitalisation for:		
Alcohol Dependence	106 (17.9%)	115 (21.0%)
Withdrawal symptoms	182 (30.6%)	197 (36.0%)
Prevent complication	383 (64.5%)	346 (63.3%)

CCI= charlson comorbidity index, AUD=Alcohol use disorder, SIMD= Scottish Index of Multiple Deprivation

Table 3. Survival descriptive characteristics by discharge setting and Socio-economic deprivation quintile.

	Median Time to relapse (years)	N. Individuals	N. Relapses	(% of individuals with relapses)
Discharge setting				
In Company	2.13	547	272	50%
alone	1.34	594	329	55%
SIMD				
1 (most deprived)	1.07	364	212	58%
2	1.58	298	167	56%
3	3.24	280	130	46%
4	3.42	153	65	42%

5 (least deprived)	0.69	46	27	58%
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SIMD= Scottish Index of Multiple Deprivation

Table 4. Cox regression output for any further hospitalisation related to AUD.

Cox Model with Discharge location and SIMD				
Time to failure		Haz.Ratio	P> z	[95% Conf. Interval]
SIMD				
	2	.871	0.199	.71 1.08
	3	.707	0.003	.56 .89
	4	.691	0.011	.52 .92
	5	1.295	0.289	.81 2.04
Discharge location				
	in company	.843	0.042	.71 .99

Cox Model with Discharge location by SIMD				
Time to failure		Haz.Ratio	P> z	[95% Conf. Interval]
SIMD				
	2	.803	0.14	.60 1.07
	3	.698	0.031	.50 .97
	4	.662	0.050	.44 1.00
	5	.667	0.315	.30 1.47
Discharge location				
	In company	.761	0.056	.57 1.01
SIMD*discharge location				
	SIMD2*in company	1.18	0.431	.78 1.80
	SIMD3*in company	1.03	0.913	.66 1.60
	SIMD4*in company	1.09	0.762	.62 1.92
	SIMD5*in company	2.88	0.035	1.07 7.71

AUD=Alcohol Use Disorder, SIMD= Scottish Index of Multiple Deprivation
reference category for discharge location: discharged alone
reference category for SIMD: SIMD=1