Title: Understanding the alcohol harm paradox: an analysis of sex- and condition-specific hospital admissions by socioeconomic group for alcohol-associated conditions in England.

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Abstract

Background and Aims In many countries conflicting gradients in alcohol consumption and alcohol-associated mortality have been observed. To understand this 'alcohol harm paradox' we analysed the socioeconomic gradient in alcohol-associated hospital admissions to test whether it was greater in conditions which were : (1) chronic (associated with long-term drinking) and partially alcohol-attributable, (2) chronic and wholly alcohol-attributable, (3) acute (associated with intoxication) and partially alcohol-attributable, (4) acute and wholly-alcohol attributable. Our aim was to clarify how (1) drinking patterns (e.g. intoxication linked to acute admissions or dependence linked to chronic conditions) and (2) non-alcohol causes (e.g. smoking and poor diet which are risks for partially alcohol-attributable conditions) contribute to the paradox.

Design Regression analysis testing the modifying effects of condition-group (1-4 above) and sex on the relationship between areas-based deprivation and admissions.

Setting England, April 2010–March 2013

Participants 9.2 million English hospital admissions where a primary or secondary cause was one of 36 alcohol-associated conditions

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Measurements Admissions by condition and deciles of Index of Multiple Deprivation (IMD). Socioeconomic gradient measured as the relative index of inequality (RII, the slope of a linear regression of IMD on admissions adjusted for overall admission rate). Conditions were categorised by ICD-10 code.

Findings A socioeconomic gradient in hospitalisations was seen for all conditions except partially attributable chronic conditions. The gradient was significantly steeper for conditions which were wholly attributable to alcohol and for acute conditions than for conditions partially alcohol-attributable and for chronic conditions. Gradients were steeper for men than for women in cases of wholly alcohol attributable conditions.

Conclusions There is a socioeconomic gradient in English hospital admissions ~~was seen~~ for most alcohol-associated conditions. The greatest inequalities are in conditions associated with alcohol dependence, such as liver disease and mental and behavioural conditions, and in acute conditions, like alcohol poisoning and assault. Socioeconomic differences in harmful drinking patterns (dependence and intoxication) may contribute to the 'alcohol harm paradox'.

Introduction

Worldwide, the burden of harm to health from alcohol consumption is high. The World Health Organisation (WHO) recognised it as one of the six leading risk factors for disease burden globally, with an estimated disease burden of 2.1m deaths and 126m lost disability adjusted life years (DALYs) worldwide in 2013 (1).

In many settings the burden of harm from alcohol-associated conditions (those which are either wholly or partially attributable to alcohol) has been shown to be borne most heavily by those of the lowest socioeconomic status (SES). For example, in the UK, risk of alcohol-associated hospitalisation and death has been shown to increase with socioeconomic deprivation (2-6). Similar relationships have been reported in Finland, Sweden and Russia (7-10). A recent study of mortality data from across Europe confirmed a similar relationship in all countries studied for both education level and work classification (11), and a review of 15 studies in 12 countries showed that the gradient was steeper for alcohol-associated mortality than for other-causes mortality (12). In addition strong evidence from a recent meta-analysis of survey data from 25 countries showed that those with less education reported more negative alcohol-related consequences than those with more eduction, after controlling for consumption (13).

The socioeconomic gradient of alcohol-associated harm is not simply explained by differences in overall alcohol consumption. For example, in England, people in the lowest SES category were more likely to abstain from drinking alcohol, more likely to be moderate drinkers and less likely to be hazardous drinkers (defined as consuming 120 to 280 grams of pure alcohol per week for females and 176 to 400 grams for males) (14, 15) but still experienced more harm (2-6) . In other Northern European countries people of lower SES also drank less (16), and a recent study of 33 low, middle- and high-income countries showed a consistent positive association between higher SES and alcohol consumption (17). A recent review by Collins (18) summarised the results of three population-based

studies in the USA which also showed those in the least deprived groups having greater alcohol use (19-21).

A number of causes have been suggested for this so-called 'harm paradox'. For example, it is possible that there is some reverse causation or 'social drift', where those who suffer more harm from alcohol consumption move to lower SES groups over time (22). There is evidence that those in lower SES groups have poorer health literacy and therefore worse health outcomes (23, 24) and it has been suggested that they may therefore have differential access to the health and social services which help reduce the harms from drinking (22).

One popular explanation is that people in lower SES groups may drink less, but have more harmful consumption patterns, or drink in less safe environments (22) (11), leading to more unintended injuries and increased risk of conditions such as alcohol poisoning or liver disease. This is supported by some evidence that those in the most deprived groups in the UK and Europe are more likely to drink to intoxication or become dependent on alcohol (5, 25-27), however, the evidence to date is almost all from self-reported consumption data, which has substantial biases. Where studies have looked at inequalities in alcohol-associated harms, they have often looked at mortality and either grouped several conditions (11) (12), or examined a single condition (28). To date, none has looked at morbidity (e.g. hospital admissions) or compared individual alcohol-associated conditions.

In England people of low SES were more likely to smoke and have an unhealthy diet (29, 30). Cohort studies have suggested that the combined effects of obesity, smoking and higher alcohol consumption increased the risk of death from conditions linked to alcohol like liver disease and head and neck cancers possibly having a more than additive effect (31, 32). However, only a few conditions have been examined, alcoholic and non-alcoholic liver disease were not separated, and only mortality results reported. Bellis et al. (33) recently showed using survey data that more deprived drinkers were more likely to combine drinking with smoking, poor diet and overweight, however, this study did not look at harms.

To understand the relative contribution of drinking patterns compared with other contributing causes including diet and smoking, it is useful to disaggregate alcohol-associated harms and look at socioeconomic gradient by condition. For example, if not only drinking, but a combination of causes including risks such as poor diet and smoking are important drivers of the harm paradox, we would expect to observe a steeper gradient in conditions which are only partially attributable to alcohol and can also be driven by these other risk factors, like head and neck cancers, diabetes and heart disease than in wholly-alcohol attributable conditions which would be unaffected by poor diet or smoking. Similarly, if differences in drinking patterns such as heavy single-occasion drinking are driving the paradox, we would expect to see different socioeconomic gradients in acute conditions such as alcohol poisoning and unintended injuries than in chronic conditions such as alcoholic liver disease and cancers, which are associated with long-term consumption.

A recent international review looked for evidence of socioeconomic gradients in mortality and morbidity from chronic alcohol-attributable conditions (28). The authors concluded that there was a lack of studies exploring the relationship between alcohol consumption, alcohol-attributable disease and SES, with evidence being particularly limited for conditions other than cancers, stroke and hypertension.

In this study we aimed to address this evidence gap for inequalities in alcohol-associated morbidity at condition level by comparing the socioeconomic gradients of different conditions, reported by sex, to see which is contributing to overall health inequalities, and therefore might explain the harm paradox. Our objective was to calculate the socioeconomic gradient of morbidity in conditions associated with alcohol consumption in England at the condition level. Specifically, we:

1. Tested the effect size and statistical significance of the modifying effect of the following four condition types on the relationship between deprivation and admissions: (1) chronic and partially alcohol-attributable, (2) chronic and wholly alcohol-attributable, (3) acute and partially alcohol-attributable, (4) acute and wholly-alcohol attributable.
2. We compared the size of the interaction effect for the two groups of acute conditions with the size of the interaction effect for the two groups of chronic conditions to assess the relative contribution of intoxication versus long-term harm from drinking to alcohol-associated health inequalities.
3. We compared the size of the interaction effect for the two groups of wholly alcohol-attributable conditions to the size of the interaction effect for the two groups of partially alcohol-attributable conditions test the contribution of alcohol versus other contributing causes such as poor diet and smoking to alcohol-associated health inequalities.
4. We tested whether sex was a modifier of these relationships.

Methods

Design

We carried out a linear regression of IMD on relative admissions (admissions for a given condition in a given IMD relative to all admissions for that condition). To determine the mediating effect of sex and of the four condition groups of interest; wholly attributable acute, wholly attributable chronic, partially attributable acute, partially attributable chronic,on the relationship between admissions and IMD we used two-way interaction terms. We then tested for an effect of sex on each of these mediators using three-way interaction terms. We controlled for age group and sex in the main effects. This regression includes 1200 data cells, containing the number of admissions for each group defined by sex, four age groups (18 to 24, 25 to 34, 35 to 54 and 55+), 15 condition groups and 10 IMD deciles.

Data

We used data on NHS hospital admissions in England where a primary or secondary cause was alcohol-associated for all individuals aged 18 to 89 years over the period April 2010 to March 2013, which were the most recent three years' data available. SES, sex and age were recorded for each admission.

The data were provided by Public Health England and taken from nationally-compiled, cleansed and validated Hospital Episode Statistics submitted by all English acute hospitals. We used admissions which were finished in the given year. Aaccident and emergency (A&E) attendances were excluded because, although data are collected, they are incomplete, diagnoses are recorded only according to

high-level A&E diagnosis codes (not ICD-10) and coding is commonly incomplete (36% in 2013-14) (34).

Each admission can have one or more diagnosis, coded using ICD-10 with the primary diagnosis code representing the main reason for admission. Admissions were classified as alcohol-associated if any of the diagnosis codes had a non-zero AAF (i.e. if any of the diagnoses were for alcohol-associated conditions). Alcohol-associated conditions were categorised according to ICD-10 codes (35) into 36 conditions following those used in the calculation of English alcohol-attributable fractions (AAFs) by Jones *et al.* (36) (See Table 1). The 36 conditions were then grouped into fifteen broader groups and categorised according to whether they were wholly or partially alcohol-attributable and whether they were associated with chronic or acute consumption effects.

[INSERT Table 1 HERE]

SES was assessed based on the Index of Multiple Deprivation (IMD) 2010. IMDs are geographic quantifiers of relative deprivation, based on 37 indicators across seven domains; income, employment, health and disability, education and skills, housing, services, accessibility, crime and living/physical environment (37). IMDs are calculated at low levels of geography (typically around 2,000 population) and admissions were categorised by the IMD decile of the patient's home address.

Statistical Analyses

Raw admissions were converted to person-specific admissions (number of people admitted for a given condition in a given year) to correct for repeat episodes by the same individual which could lead to bias where a small number of individuals experience multiple admissions. This measure indicates the burden of morbidity on individuals in the population rather than on the healthcare system. Individuals with multiple alcohol-associated diagnoses were also counted under one condition. In line with previous analyses (38), the condition selected was the diagnosis with the largest AAF. If two or more episodes had equal highest AAF, the earliest episode was and if two or more diagnoses had equal highest AAF within the same episode, the top diagnostic position was used.

Our metric for the socioeconomic gradient in alcohol-associated hospital admissions was the relative index of inequality (RII) (39). The RII is the slope of the regression line when regressing relative admission rate against IMD decile (1 being the least deprived and 10 being the most deprived decile), multiplied by 10. The relative admission rate is the rate of admissions for a condition in a given IMD divided by the rate of admissions for that condition in all IMDs. The RII represents a linear summary of the change in admission rate for a given condition when moving from the least to the most deprived decile. A positive slope indicates a positive association between admissions and deprivation. We used relative admissions rather than absolute to control for large variations in admission volumes between conditions (regardless of how many of those admissions were alcohol-attributable) as a result of including all admissions and not just alcohol-attributable admissions. It was important to use all admissions, and not adjust for AAF, because one of the key comparisons

was between partially and wholly alcohol-attributable conditions. The gradient in partially alcohol-attributable conditions in this case shows the contribution of not just alcohol consumption but all contributing causes to socioeconomic inequality in admissions. The RII can be interpreted as the additional admissions experienced when moving from the least deprived to the most deprived group, relative to baseline.

Data on a total of 9,239,629 person-specific admissions in England were included. We applied linear regression to determine the effect of the four condition groups of interest on the relationship between admissions and IMD, and the effect of sex on each of these mediators, whilst controlling for age and sex in the main effects stepwise in three models, as follows:

Model 1: $Y = \beta_1 IMD + \beta_2 Age + \beta_3 Sex\ \beta_4 IMD*Sex + \varepsilon$

Model 2: $Y = \beta_1 IMD + \beta_2 Age + \beta_3 Sex + \beta_4 Wholly + \beta_5 Acute + \beta_6 IMD*Wholly + \beta_7 IMD*Acute + \beta_8 IMD*Sex + \varepsilon$

Model 3: $Y = \beta_1 IMD + \beta_2 Age + \beta_3 Sex + \beta_4 Wholly + \beta_5 Acute + \beta_6 IMD*Wholly + \beta_7 IMD*Acute + \beta_8 IMD*Sex + \beta_9 Sex*Wholly + \beta_{10} IMD*Sex*Wholly + \varepsilon$

where Y is the relative person–specific admissions calculated as follows:

$$\frac{Admissions\ for\ condition\ c\ in\ IMD\ decile\ i}{Admissions\ for\ condition\ c\ in\ all\ IMD\ deciles}$$

and is dependent on sex (0=female, 1=male), age (categorical covariate with 4 age groups 18-24, 25-34, 35-54, 55+), and IMD (1=least deprived to 10=most deprived). The main condition-related covariates of interest are wholly (0=partially alcohol-attributable, 1=wholly alcohol-attributable) and acute (0=chronic, 1:=acute).

We weighted by the overall number of admissions multiplied by the AAF. In this way the coefficient of IMD on relative admissions gave the RII, the coefficient of the two-way interaction terms of wholly with IMD and Acute with IMD measured the extent to which condition-group acted as a moderator of the underlying RII and the co-efficient of each three-way interaction term measured the extent to which sex acted as a moderator of condition-group effects. The regression also provided the estimate of statistical significance (P value) and 95% confidence interval interval (2 tailed, alpha = 0.05).

Results

The overall age-standardised person-specific admission rate for all alcohol-associated conditions was 6,712 per 100,000 population per annum for men and 6,191 for women . The admission rate and alcohol-attributable admission rate for each condition by sex is shown in Table 2.

[INSERT Table 2 HERE]

The condition with most admissions and alcohol-attributable admissions was hypertensive diseases (over 2,300 admissions per 100,000 per annum for women and over 3,400 for men, of which 458 (women) and 846 (men) were alcohol attributable). Alcohol-specific mental and behavioural disorders were the second largest cause of alcohol-attributable admissions, with 135 (women) and 364 (men) alcohol-attributable person-specific admissions per 100,000 population per annum.

Table 3 reports the result of the regression analysis. Model 3 provided the best fit, with model R-squared of 0.60. Model 3 was also tested with the addition of an IMD x Sex x Acute interaction, but this interaction was not statistically significant and so was removed in the final model. The coefficient for IMD was close to zero as a main effect, showing no association between higher levels of deprivation and relative admissions in the reference case. Admissions were statistically significantly higher in those aged 35-54 than in the younger age groups, and higher again in those aged 55 or older, which agrees with prior expectations. There were also statistically significantly more men admitted than women. In the main effects, admissions were statistically significantly lower for wholly alcohol attributable conditions compared to the reference case, reflecting the fact that partially alcoholattributable conditions like injuries and hypertension are responsible for the largest number of admissions.

The interaction terms between condition-groups, sex and IMD tell us whether these effects mediate a gradient between IMD and admissions. The coefficient for the interaction term between wholly alcohol-attributable conditons and IMD was positive and statistically significant, showing that for both sexes there was a positive socioeconomic gradient for wholly alcohol-attributable conditions which did not exist for partially attributable conditons. The coefficient for the interaction between IMD and acute conditions was also positive and significant, showing that for both sexes there was a positive socioeconomic gradient for acute conditions which did not exist for chronic conditons. However, the coefficient for the interaction between sex and IMD was non-significant, suggesting that sex did not mediate the socioeconomic gradient directly.

A three-way interaction term between IMD, wholly alcohol-attributable conditions and sex was positive and significant, suggesting that wholly-attributable conditions have a steeper socioeconomic gradient in men than women. A three-way interaction between IMD, acute conditions and sex was also tested, but proved non-significant and was therefore dropped from the final model.

These findings are illustrated in Figure 1 which shows the RII calculated by combining the relevant significant coefficients from the model in Table 3 for each condition group and by sex. The RII can be interpreted as the additional admissions associated with a move from the least deprived to the most deprived IMD decile. The fact that there is no significant RII for partially-attributable chronic conditions reflects the fact that despite most of these conditions having a positive socioeconomic gradients in all age groups, conditions such as hypertension, stroke, injuries and non-head and neck cancers appear to demonstrate either reverse socioeconomic gradients or ‘inverse-U’ shaped gradients (where those in the middle SEGs are admitted most) in the older age groups, and due to the large volumes of admissions for these conditions in older ages, this effect offsets the positive gradient in other conditions.

Discussion

Socioeconomic inequalities in admissions were observed across many alcohol-associated health conditions, but the magnitude of these inequalities varied by condition. They were greater in conditions wholly associated with alcohol consumption than in partially-attributable conditions and greater in conditions associated with intoxication than in those associated with long-term consumption. In men, the gradient for wholly-attributable conditions was even steeper. Inequalities in admissions were particularly high for both alcohol-specific mental and behavioural disorders and

chronic alcohol-specific conditions like liver disease. These two chronic conditions together contribute almost a quarter of the alcohol-attributable admissions in the data (more than twice as many as the acute admissions) and therefore play an important role in the overall burden of alcohol-associated health inequalities. The biggest contributor to alcohol-attributable admissions, however, hypertension, had amongst the lowest level of inequality.

Sex was a significant mediator of inequalities, with men experiencing greater inequalities in wholly alcohol-attributable conditions such as alcohol-specific mental and behavioural disorders and liver disease. This suggests higher rates of alcohol dependence among more deprived males. The moderating effect of sex on socioeconomic gradients in alcohol-related harm was also observed in two other recent studies (40) (41).

Our results lend further support to previous findings that different patterns in drinking between socioeconomic groups, in particular harmful patterns of single-occasion drinking and alcohol dependence could be part of the reason for the observed 'alcohol harm paradox' (5, 11, 22, 25-27). They also suggest that other causes, including smoking and poor diet may not be as important in explaining the paradox as has been suggested by evidence on behaviours (42).

It is worth bearing in mind that substantial inequalities in partially-attributable conditions might be expected even in the absence of alcohol-associated harm. The inequalities we observed in partially-attributable acute conditions like assault and self-harm seem to support the previous suggestion that other contributing causes associated with these harms could be influencing the harm paradox, for example, the safety and policing of places where people drink as well as access to mental health services (22).

The findings are important in furthering our understanding of the causes of the alcohol harm paradox. They may also give some clues as to which risks to target to prevent harm in a way which reduces alcohol-associated health inequalities. For example, our findings suggest that policies and interventions to tackle dependence, such as increased treatment provision and an emphasis on early identification within primary care are important, since they address one of the most prevalent and unequal causes of harm. However, they may be more effective in reducing alcohol-associated health inequalities in men than in women.

To our knowledge this is the first time that inequalities in admissions have been examined for the full range of alcohol-associated conditions. This work supports previous findings on inequalities in alcohol-associated health harm, and sheds new light on the alcohol harm paradox in the UK, suggesting that single-occasion drinking patterns, as well as dependence, play an important role.

The key strength of this study is the use of comprehensive, high quality national-level datasets of hospital admissions for multiple years. This represents the most complete and highest quality data currently available on hospital attendances in the UK.

A limitation of the study is that the data used were for hospital admissions only, and therefore do not provide any information about primary care use or accident and emergency attendance. Therefore, morbidity is likely to be underestimated and there is potential for confounding if, for example, people in different SES groups are more or less likely to use different types of services. A recent study in a UK accident and emergency department found that 21% of attendances were

either wholly or partially due to alcohol (45). A higher rate of alcohol-associated attendances was observed in men than women along with high rates of attendance for self-harm and withdrawal, similar to our findings. Very high rates of attendance for unintended injuries were also reported, whereas in our non-acute admissions we observed relatively low rates. This seems likely to reflect a large number of emergency attendances for less serious injuries which did not require admission and which we are therefore unable to characterise using the current data. Another recent study in a UK accident and emergency department found that, of those attendances which were due in part to dependent or hazardous drinking, a greater proportion were from the most deprived areas (46). This suggests that a similar socioeconomic gradient exists in emergency attendances as we observed in admissions.

An additional limitation of the study is the use of an area-based deprivation measure, in the absence of specific data on patients' income, employment or education. As discussed by Collins, evidence of association between consumption and area level measures of deprivation has often been more mixed than with individual measures of deprivation (18). The IMD is a quality-assured measure, based on very small areas (47), however, as with any area level measure there will be some individuals who will be misclassified and this could affect our findings.

Our method of using the most alcohol-attributable condition associated with a given admission did not allow us to compare admissions where multiple causes may have contributed. For example, although acute conditions such as assault are associated with intoxication, we are not able to assess the extent to which admissions for these conditions are amongst people who are also dependent drinkers or long-term heavy drinkers. Since there is likely to be crossover between long term consumption and intoxication, we were not able to charactise these crossover effects in the current study.

Conclusions

Evidence from this analysis suggests that socioeconomic inequalities in hospital admissions varies across different alcohol-associated conditions, with the greatest inequalities being seen in conditions associated with alcohol dependence such as liver disease and mental and behavioural conditions, and in acute conditions like alcohol poisoning and assault. We conclude that socioeconomic differences in harmful drinking patterns (dependence and intoxication) are an important part of the explanation of the 'alcohol harm paradox'.

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Table 1. Specific conditions included in each of the 15 categories, including ICD-10 codes**. Alcohol-specific conditions in bold.**

Condition Category	Condition Group	Conditions Included	ICD-10 Codes
Chronic	**Alcohol-related mental and behavioural disorders**	**Mental and behavioural disorders due to use of alcohol**	**F10**
	Chronic alcohol-attributable conditions	**Alcohol-induced pseudo-Cushing's syndrome, alcoholic cardiomyopathy, degeneration, alcoholic myopathy, alcoholic polyneuropathy, alcoholic gastritis, alcoholic liver disease**	**E24.4, I42.6, G31.2, G72.1, G62.1, K29.2, K70.0-K70.4, K70.9**
	Epilepsy	Epilepsy and status epilepticus	G40-G41
	Diabetes	Diabetes mellitus (type II)	E10-E14
	Cirrhosis of the liver	Cirrhosis of the liver	K73-K74
	Head & neck cancer	Malignant neoplasm of larynx, lip, oral cavity and pharynx	C32, C00-C14
	Ischaemic heart disease and stroke	Ischaemic stroke, ischaemic heart disease	I63-I67, I69.3, I20-I25
	Hypertensive diseases	Hypertensive diseases	I10-I14
	Chronic partially-alcohol-attributable conditions	Cardiac arrhythmias, haemorrhagic and other non-ischaemic stroke, lower respiratory infections (pneumonia), acute and chronic pancreatitis	I47-I48, I60-I62, I69.0-I69.2, J09-J22, J85, P23, K85-K86 K85.2, excluding K86.0
	Other cancers	Malignant neoplasm of liver and intrahepatic bile ducts, oesophagus, colon, rectum and breast	C22, C15, C18-C21, C50
Acute	Assault	Assault	X85-Y09, Y87.1
	Poisoning (alcohol)	**Toxic effect of alcohol, excessive blood level of alcohol, accidental poisoning by exposure to alcohol**	**R78.0, X45, Y15, T51.0, T51.1, T51.8, T51.9**
	Poisoning (other)	Accidental poisoning by exposure to noxious substances	X40-X49 excluding X45
	Self-harm	Intentional self-harm and other intentional injuries	Y35, X60-X84, Y87
	Unintended injuries	Drowning, fall injuries, transport injuries (including road traffic accidents), exposure to mechanical forces (including machinery accidents) and other unintentional injuries	W00-W19, V01-V98, W65-W74, W75-W99, X30-X33, X50-X58, Y85.0, W20-W52

Table 2. Overall rate of admissions in England for each condition, per 100,000 population per annum (age-standardised) and alcohol attributable admissions by sex.

		Admissions per 100,000 per annum		Alchol-attributable admissions per 100,000 per annum		
Condition	**Category**	**Male**	**Female**	**Male**	**Female**	**N (total admissions in 3-year period)**
Chronic	Alcohol-related mental and behavioural disorders*	364	135	364	135	72,023
	Chronic alcohol-attributable conditions*	70	30	70	30	376,700
	Epilepsy	207	206	71	44	76,757
	Diabetes	336	211	-13	-43	33,142
	Cirrhosis of the liver	26	28	12	11	316,823
	Head & neck cancer	34	14	14	5	385,449
	Ischaemic heart disease and stroke	446	546	-40	-43	307,781
	Hypertensive diseases	3,499	2,369	846	458	4,072,650
	Chronic partially-alcohol-attributable conditions	697	1,162	117	116	699,369
	Other cancers	116	322	37	47	1,319,566
Acute	Assault	64	14	10	1	38,266
	Poisoning (alcohol)*	42	52	42	52	1,337,979
	Poisoning (other)	15	17	2	1	98,226
	Self-harm	48	70	7	5	66,290
	Unintended injuries	749	1,016	155	92	25,830
Total		6,712	6,191	1,693	910	9,226,851

**wholly alcohol-attributable conditions (other conditions are partially alcohol-attributable)*

Note that negative alcohol attributable admissions are for conditions where moderate drinking has been shown to have a protective effect

Table 3 Results of linear regression of a age, sex and condition group variables on the relative level of admissions recorded.

		Model 1			Model 2			Model 3		
Variable		**Coefficient (95% CI)**		**P value**	**Coefficient (95% CI)**		**P value**	**Coefficient (95% CI)**		**P value**
IMD		0.04	(-0.01 - 0.09)	0.130	-0.09	(-0.14 - -0.04)	<0.001	-0.03	(-0.08 - 0.02)	0.25
Age										
	18-24	reference			reference			reference	-	
	25-34	0.09	(-0.40 - 0.58)	0.715	-0.02	(-0.47 - 0.42)	0.916	-0.02	(-0.45 - 0.41)	0.921
	35-54	1.22	(0.80 - 1.63)	0.000	1.01	(0.63 - 1.39)	<0.001	0.95	(0.58 - 1.32)	<0.001
	55+	3.38	(2.99 - 3.78)	<0.001	3.09	(2.70 - 3.48)	<0.001	3.01	(2.64 - 3.38)	<0.001
Sex	**female**	reference			reference			reference	-	
	male	-0.04	(-0.46 - 0.37)	0.842	-0.01	(-0.38 - 0.37)	0.974	0.54	(0.12 - 0.95)	0.011
Alcohol attributable	**partially**				reference			reference	-	
	wholly				-3.09	(-3.53 - -2.65)	<0.001	-2.44	(-3.15 - -1.73)	<0.001
Acute vs chronic	**chronic**				reference			reference		
	acute				-0.94	(-1.46 - -0.42)	0.000	-0.26	(-0.82 - 0.31)	0.372
IMD x Sex		0.11	(0.05 - 0.17)	0.001	0.10	(0.04 - 0.15)	0.001	-0.01	(-0.07 - 0.05)	0.735
IMD x Wholly					0.46	(0.40 - 0.52)	<0.001	0.25	(0.15 - 0.35)	<0.001
IMD x Acute					0.09	(0.01 - 0.16)	0.025	0.11	(0.04 - 0.19)	0.003
Sex x Wholly								-1.07	(-1.95 - -0.19)	0.018
Sex x Acute								-1.31	(-1.74 - -0.88)	<0.001
IMD x Sex x Wholly								0.32	(0.20 - 0.45)	<0.001
Model R-squared		0.47			0.56			0.60		
Model AIC		8619			8381			8286		

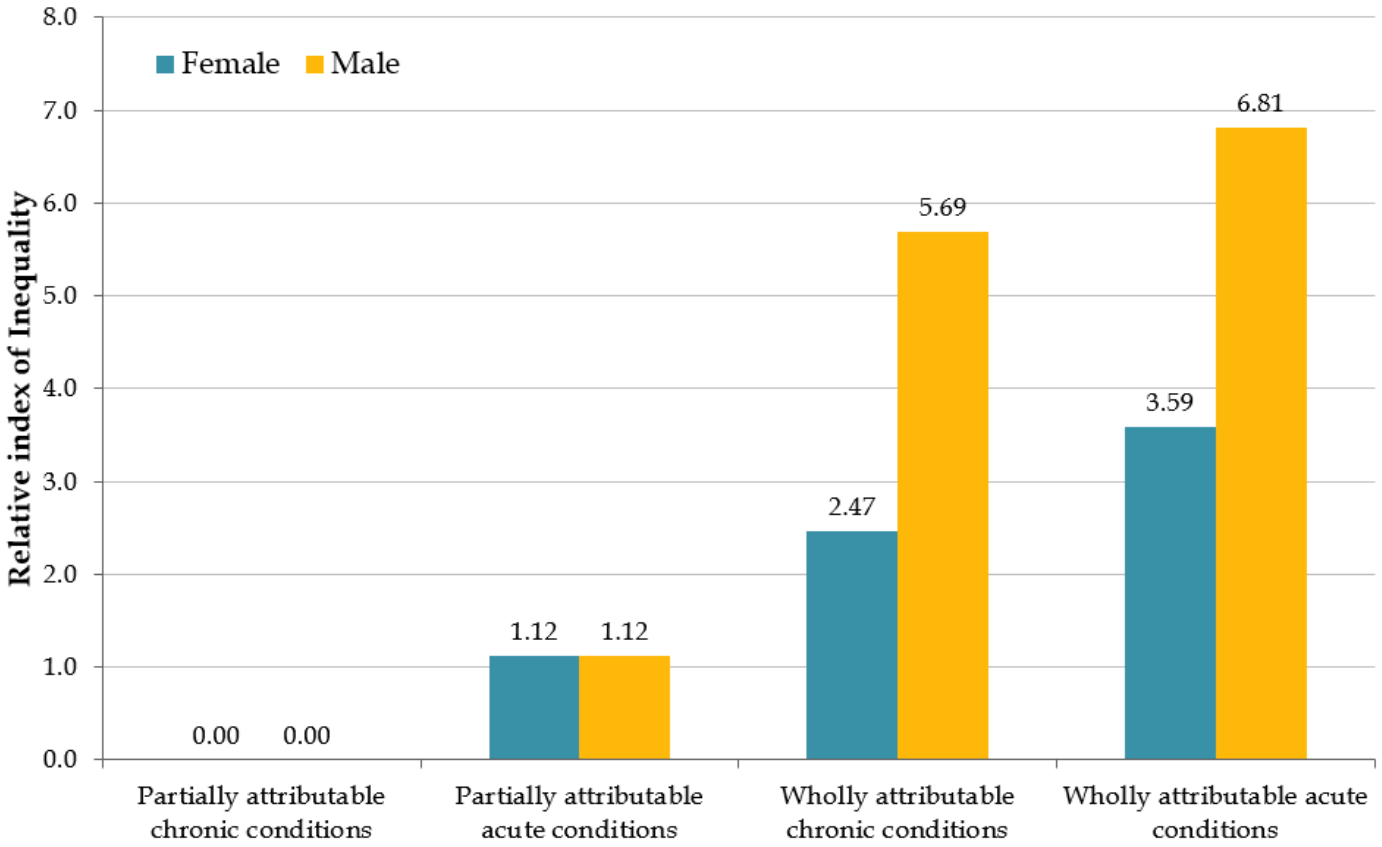

Figure 1 Relative index of inequality (RII) for each of the four condition-type groups of interest, taken from the regression results in Model 3 presented in Table