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Drinking in denial: Irish drinkers' awareness of their alcohol use

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Title page

Title: **Drinking in denial: Irish drinkers' awareness of their alcohol use**

Authors:

Deirdre Mongan, Health Research Board, Ireland dmongan@hrb.ie

Seán R. Millar, Health Research Board, Ireland; School of Public Health, University College Cork, Ireland smillar@hrb.ie

Claire O'Dwyer, Health Research Board, Ireland CODwyer@hrb.ie

Jean Long, Health Research Board, Ireland jlong@hrb.ie

Brian Galvin, Health Research Board, Ireland bgalvin@hrb.ie

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Drinking in denial: Irish drinkers' self-perception of their alcohol use

Corresponding Author:

Deirdre Mongan, Health Research Board, Ireland; Grattan House 67–72 Lower Mount Street, Dublin 2; Tel: +353-1-2345184 Email: dmongan@hrb.ie

Abstract

Objectives: Ireland has high per capita alcohol consumption and high levels of problematic drinking patterns. It is not clear if Irish people are aware of the extent of their problematic drinking. The aim was to determine awareness of drinking patterns in an Irish population and to identify characteristics associated with self-awareness of hazardous/harmful drinking.

Setting: 2014/2015 Irish Drug Prevalence Survey which recruited a stratified clustered sample of 7,005 individuals living in the Republic of Ireland.

Participants: Survey respondents who had not consumed alcohol in the last year were excluded. 5,397 (77%) of the 7,005 survey respondents were included in the analyses.

Primary and secondary outcome measures: Hazardous drinking as defined by monthly risky single occasion drinking (RSOD); harmful drinking defined by meeting DSM-IV criteria for alcohol dependence; self-reported awareness of engaging in a hazardous/harmful drinking pattern

Results: Of those reporting a hazardous/harmful pattern of drinking, 67% were unaware of this and misclassified themselves as a light or moderate drinker who did not engage in RSOD. An adjusted logistic regression model identified that respondents who had completed third level education were more likely to be aware of their drinking pattern (OR = 1.80, 95% CI: 1.30–2.49), as were drinkers who engaged in risk taking behaviours such as illicit drug

use and gambling. Older drinkers (65+) were less likely to be aware of their drinking pattern (OR = 0.30, 95% CI: 0.14–0.65).

Conclusions: Our results confirm that patterns of alcohol use in Ireland are problematic. Older respondents and those with lower educational attainment are less likely to be aware of their hazardous or harmful drinking pattern. There is a population of younger, more-educated drinkers who engage in risk-taking behaviours who are aware of their harmful drinking. Initiatives to reduce overall alcohol consumption and raise awareness around drinking patterns are required.

Article Summary

Strengths and limitations of this study:

- To the best of our knowledge this is the first study to attempt to identify factors associated with the public's self-perception of their own drinking with their actual drinking pattern using a general population survey
- The survey had a large sample size of 7,005, and respondents were selected using a random probability sample that was representative of the Irish population, allowing our results to be generalised to the Irish population
- While our results are nationally representative, response bias may also be considered a limitation; self-reporting biases are common to alcohol use surveys and lead to underestimation of alcohol consumption

Introduction

Alcohol is responsible for approximately 3.3 million deaths worldwide annually and 5.1% of the global burden of disease is attributable to alcohol consumption.[1] A person's pattern of drinking is an important determinant of alcohol-related harm. While there has traditionally been a focus on overall volume of drinking, greater attention is now being paid to the impact of drinking pattern on harms over and above the effects from total alcohol consumption. Risky single occasion drinking (RSOD), also referred to as binge drinking or heavy episodic drinking, is associated with a number of negative health, social, and economic consequences. Health harms include liver cirrhosis, coronary heart disease, and various types of cancer.[2-4] RSOD may also impair judgement, increasing the likelihood of driving under the influence of alcohol, intentional self-harm, injury, and risky sexual behaviours. Alcohol dependence is a chronic condition and is defined as 'a cluster of physiological, behavioural, and cognitive phenomena in which the use of alcohol takes on a much higher priority for a given individual than other behaviours that once had greater value'.[5]

Alcohol use in Ireland is characterised by relatively high levels of abstention coupled with high per capita consumption and a high level of problematic drinking patterns. While surveys consistently report that 20–25% of Irish adults abstain from alcohol,[6-8] the most recent available figures indicate that Ireland is the sixth heaviest drinking nation among Organisation for Economic Co-operation and Development (OECD) countries in terms of the

overall volume of alcohol consumed.[9] The World Health Organization (WHO) reported in 2014 that 37% of all Irish people aged 15 years and over had engaged in heavy episodic drinking or RSOD in the past 30 days, placing Ireland in third place among the 194 countries analysed.[1] Three-quarters of all alcohol consumed in Ireland is done so as part of a RSOD session.[7]

While it is accepted that patterns of alcohol consumption in Ireland are a cause for concern, it is not clear if Irish people are actually aware of the extent of their hazardous or harmful pattern of drinking. The aim of this study was to determine awareness of drinking patterns in an Irish population using a representative random sample and to identify characteristics associated with self-awareness of hazardous or harmful drinking.

Methods

Sampling and study population

We analysed data from Ireland's 2014/15 Drug Prevalence Survey. This national survey recruited a stratified clustered sample of 7,005 individuals aged 15 years and over, living in private households in Ireland. The sampling frame used was the GeoDirectory, which is a list of all addresses in the Republic of Ireland, and distinguishes between residential and commercial establishments. A three-stage process was used to construct the sample for this survey. The first stage involved stratifying the population into 10 former health board regions in Ireland. In the second stage of stratification, 421 electoral divisions were selected as the primary sampling units across the 10 former health board regions. Before selection, the primary sampling units were ranked by the following socio-demographic indicators: population density, male unemployment and social class, to ensure that a representative

cross-section of areas were included. Finally, in each primary sampling unit, 31 addresses were chosen randomly, and at each address, one person was selected to participate in the survey, using the 'last birthday' rule. The achieved sample was weighted by gender, age and former health board region to maximise its representativeness of the general population. A more comprehensive description of the survey's methodology has been detailed elsewhere.[10] The survey involved a face-to-face interview in the participants' home and a self-completion questionnaire. Respondents also self-completed questions in relation to alcohol dependence and their perception of their own drinking pattern. The home interviews were conducted by trained interviewers using Computer Assisted Personal Interviewing (CAPI). Interviews were completed between August 2014 and August 2015, and achieved a 60% response rate. The survey was granted ethical approved by the Royal College of Physicians in Ireland and all participants gave written informed consent.

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination of the research study.

Definitions of drinking patterns

Current drinkers were defined as those who had consumed alcohol at least once in the last 12 months. Non-drinkers, categorised as those who had not consumed alcohol in the past year (n=1,608), were excluded from this study.

Hazardous drinking – Regular RSOD in the past year

There are no internationally agreed definitions on how much alcohol constitutes a RSOD episode or on what is regular RSOD. We defined RSOD as consuming 60g of pure alcohol on a single drinking occasion. Respondents were asked how often they had consumed the equivalent of six standard drinks on a single drinking occasion in the past year. In Ireland, a standard drink contains 10g of pure alcohol. Frequency of RSOD was measured as follows: daily, 5–6 times a week, 4 times a week, 3 times a week, 2 times a week, once a week, 2–3 times a month, once a month, 6–11 times a year, 2–5 times a year and once a year. The concept of a standard drink and what constitutes 60g of alcohol was explained in detail to each respondent and visual aids were provided depicting 60g of alcohol according to beverage type. We defined hazardous drinking as engaging in RSOD at least monthly in the previous 12 months, similar to the WHO definition.[1]

Harmful drinking – alcohol dependence

Alcohol dependence was defined according to DSM-IV criteria, and was measured via self-completed questionnaire using the ten items that denote alcohol dependence from the Composite International Diagnostic Interview, an instrument that is used in many general population studies.[11] Alcohol dependence was established from a positive response in three or more of the seven domains on the DSM-IV diagnostic criteria in the twelve months before the interview.[12] Drinkers who met the criteria for both regular RSOD and alcohol dependence were assigned to the alcohol dependence drinking type. Respondents who did not have complete data on RSOD and a DSM-IV score (n=236) were excluded from the analysis.

Low-risk drinking

For this study, low-risk drinking was defined as drinking that did not fit our criteria of hazardous or harmful drinking i.e. those drinkers who were not alcohol dependent and who also did not engage in regular RSOD.

Self-perception of own drinking

Drinkers were asked to describe their own drinking by selecting one of the following six statements: '*I am a heavy drinker'; 'I am a heavy drinker and sometimes I binge drink'; 'I am a moderate drinker'; 'I am a moderate drinker and sometimes I binge drink'; 'I am a light drinker';* or *'I am a light drinker and sometimes I binge drink'*. This question was cognitively tested prior to the survey and the wording used reflects the feedback received from the participants following the cognitive testing exercise on their understanding of the terms used. This question was answered by respondents via self-completed questionnaire. No descriptions of the terms 'light', 'moderate', 'heavy' or 'binge' were provided to respondents. The terms 'light' and 'moderate' were used in this question instead of 'low-risk' as they are terms generally used in Ireland to denote low-risk drinking. Similarly, the term 'binge' was used instead of RSOD. For this analysis we combined the categories '*I am a light drinker*' and '*I am a moderate drinker*'; the categories '*I am a light drinker and sometimes I binge drink*' and '*I am a moderate drinker and sometimes I binge drink*'; and the categories '*I am a heavy drinker*' and '*I am a heavy drinker and sometimes I binge drink*'. We then compared respondents' self-perception of their own drinking against their drinking patterns as measured elsewhere in the questionnaire through the RSOD and DSM-IV questions.

Awareness of hazardous and harmful drinking

Respondents were considered to be unaware of their own hazardous and harmful drinking if they incorrectly underestimated their drinking pattern i.e. those regular RSOD drinkers who classified themselves as light or moderate drinkers who do not binge drink and dependent drinkers who classified themselves as light or moderate drinkers who may or may not sometimes binge drink. Respondents were considered to be aware of their own hazardous or harmful drinking pattern if they described themselves as sometimes binge drinking or as a heavy drinker.

Statistical analysis

The distribution of drinking pattern was analysed by socio-demographic and addictive behaviour variables that are associated with alcohol. The socio-demographic variables analysed were age, sex, marital status, education, employment, region, dependent children; and the addictive behaviour variables analysed were smoking status (defined as being a current smoker), last year gambling (excluding lottery), and last year illicit drug use. This was analysed by cross-tabulation and statistical significance was assessed by the Pearson χ^2 test. Cross-tabulation was used to compare the drinking pattern of respondents as measured using the RSOD and DSM-IV questions to their self-perceived drinking pattern. With consideration for missing values, only valid percentages are reported.

Univariate logistic regression analyses were performed to determine factors associated with self-awareness of drinking pattern. Those variables which were identified as being significant or borderline significant ($P<0.1$) were then entered into a multivariable logistic regression model which was used to estimate adjusted odds ratios of being self-aware of hazardous or harmful drinking. The ability of variables identified in multivariable analysis to

separate cases from non-cases was evaluated using the *c* statistic. For all analyses, a P value of less than 0.05 was considered to indicate statistical significance. Data were analysed using Stata Version 15.1 (Stata Corporation, College Station, TX, USA). Results are displayed using weighted data.

Results

Drinking patterns of respondents

Of the 7,005 survey respondents, 5,397 (77.0%, 95% CI: 75.7–78.3) had consumed alcohol in the last year; among current, or last year drinkers, a drinking pattern could be assigned to 5,144. Just over half (51.6%, 95% CI: 49.9–53.2) of drinkers were low-risk drinkers, 38% (95% CI: 36.4–39.6) engaged in regular RSOD, and 10.5% (95% CI: 9.4–11.6) were dependent drinkers. Table 1 presents the characteristics of drinkers by drinking pattern. Men accounted for 51.7% of drinkers, 56.3% of drinkers were employed and 48.8% had completed third level education. Low-risk drinkers were predominantly female, aged over 35 years and married. The characteristics of regular RSOD and dependent drinkers were similar; they were more likely to be male, young and single. Low-risk drinkers were most likely to have dependent children (42.6%). The likelihood of engaging in other addictive behaviours increased as hazardous/harmful drinking pattern increased. Smoking was observed in 18.5% of low-risk drinkers, compared to 31.1% of RSOD drinkers and 49.6% of dependent drinkers. Illicit drug use was observed in 2.8% of low-risk drinkers, 11.6% of RSOD drinkers and 33.9% of dependent drinkers, while the respective figures for gambling were 26.4%, 41.4% and 56.6%. The three drinking pattern categories differed with statistical significance for all variables with the exception of education.

Self-perception of own drinking and comparison with own drinking pattern

Information on drinking pattern and self-defined drinking category was available for 5,053 respondents. The majority of drinkers (70.9%) classified themselves as light or moderate drinkers who do not binge drink, 26.7% categorised themselves as light or moderate drinkers who sometimes binge drink, and 2.4% classified themselves as heavy drinkers (Table 2). Most low-risk drinkers (83.8%) described themselves as light or moderate drinkers. Almost two-thirds of regular RSOD drinkers and one-third (33.8%) of dependent drinkers described themselves as light or moderate drinkers. Just 35.1% of regular RSOD drinkers stated that they sometimes engaged in binge drinking and just 16% of dependent drinkers described themselves as a heavy drinker. A similar trend was observed among males and females. However, dependent female drinkers were less likely than males to describe themselves as a heavy drinker (11.4% vs. 18.7%). There were 426 (16.2%) low-risk drinkers and 29 (1.5%) regular RSOD drinkers who over-estimated their drinking pattern.

Awareness of own drinking among hazardous/harmful drinkers

Of those who had a hazardous or harmful pattern of drinking, 67.9% were unaware of this and misclassified themselves as being either a light or moderate drinker. Self-awareness of hazardous or harmful drinking pattern by socio-economic demographics and other addictive behaviours is presented in Table 3. In unadjusted analyses, respondents who were younger, who had completed secondary or third level education, and those who had engaged in illicit drug use and gambling in the previous year were significantly more likely to be aware that their drinking pattern was hazardous or harmful. Survey participants who were older, married and who were engaged in home duties or retired were significantly less likely to be aware that their drinking pattern was hazardous or harmful.

An adjusted logistic regression model identified that respondents aged 65 years and over were 0.3 times (95% CI: 0.14–0.65) as likely to be aware of their hazardous or harmful drinking pattern compared to those aged 15–24 years (Table 4). Higher education was also associated with self-awareness of hazardous or harmful drinking in multivariable analysis, with those who had completed third level education being 1.8 times (95% CI: 1.30–4.60) more likely to be aware compared to those who had completed primary education only. Participants who were aware of their hazardous or harmful drinking pattern were also more likely to engage in illicit drug use (OR = 1.45, 95% CI: 1.04–2.01) or to gamble (OR = 1.60, 95% CI: 1.27–2.01). The *c* statistic for a model which included these variables was 0.65 (95% CI: 0.63–0.68).

Discussion

Main findings of the study

The results of this study confirm that patterns of alcohol use in Ireland are problematic. Almost half of all drinkers either engage in frequent RSOD (38%) or score positive for alcohol dependence (10.5%). In addition to hazardous and harmful drinking patterns being commonplace in Ireland, this study finds that a majority of those who engage in such patterns of drinking are unaware of this. Low-risk drinkers were mostly aware of their own pattern of drinking, although 16.2% overestimated their drinking pattern. In comparison, awareness of drinking pattern was low for regular RSOD drinkers and for dependent drinkers. One-third (33.8%) of drinkers with a positive DSM-IV score self-categorised themselves as being either a light or moderate drinker and a further 50.3% described themselves as a light or moderate drinker who sometimes binge drinks. Given that alcohol

dependence is a maladaptive pattern of alcohol consumption, manifested by symptoms leading to clinically significant impairment[13], it is particularly concerning that so many Irish people with alcohol dependence believe themselves to be light or moderate drinkers. Our adjusted regression analysis found that factors independently associated with self-awareness of hazardous or harmful drinking pattern were having a higher educational level and engaging in risk taking behaviours, such as illicit drug use and gambling, while those aged 65 and over were significantly less likely to be aware of their hazardous or harmful drinking pattern. Nevertheless, the *c* statistic demonstrated that the ability of our model to separate cases from non-cases was poor. This indicates that there are likely to be other factors which we have not identified that are associated with awareness of drinking pattern in this population and that further research is required to identify these factors.

Strengths and limitations

To the best of our knowledge this is the first study to attempt to identify factors associated with the public's self-perception of their own drinking with their actual drinking pattern using a general population survey. A further strength is that the survey had a large sample size of 7,005, and respondents were selected using a random probability sample that was representative of the Irish population; thus our findings are generalisable to the whole population. We also used valid and reliable measures of hazardous and harmful alcohol consumption, namely the frequency of RSOD and the DSM-IV questionnaire.

However, this study has a number of limitations which need to be considered when interpreting the findings. While our results are nationally representative, response bias may also be considered a limitation; general population surveys such as this often fail to recruit

the heaviest drinkers, as they may be difficult to contact and if contacted may be less likely to agree to participate.[14] Self-reporting biases are common to alcohol use surveys and lead to underestimation of alcohol consumption. The usual range of coverage from surveys is in the region of 40–-60%.[15, 16] In a 2013 Irish population survey, self-reported alcohol consumption based on 'typical drink questions' accounted for just 39% of per capita sales, even though the concept of a standard drink was explained in detail to each respondent and visual aids were provided.[7] Finally, there were discrepancies between the definitions used to define drinking patterns and the categories that respondents were asked to select from to self-assess their own drinking. However, it was felt that the alcohol terms typically used in clinical and research settings would not be as easily understood by the general public, and this was corroborated by the cognitive testing of the questionnaire that was undertaken prior to the survey.

Comparison with previous work

The available evidence suggests that knowledge on standard drinks and drinking guidelines both in Ireland and internationally is limited, which may help explain why so few respondents correctly identified their pattern of drinking. A Swedish study reported low levels of knowledge of standard drink and hazardous drinking concepts among hazardous drinkers.[17] A review of the literature on standard drinks for the European Joint Action on Alcohol found little understanding of what the term 'standard drink' actually means and that drinkers are not able to define standard drinks accurately.[18] A 2012 Irish survey demonstrated that while 58% had heard of the term 'standard drink', just 39% knew how many standard drinks are in a pint of lager and 33% knew how many standard drinks are in a single measure of spirits, which are the typical serving sizes of lager and spirits in Ireland.[19]

In the UK, knowledge of the previous drinking guidelines was poor, in spite of them having been in place for 20 years. In 2012, only about one-quarter of people were able to provide a correct estimate of how many units it was recommended their gender should not exceed in a day, which corresponded to a lower level of awareness than in 2009. This suggests that previous efforts to raise awareness of recommended drinking limits have not had lasting effect.[20] In Australia 53.5% correctly identified the guideline threshold for women and 20.3% did so for men.[21]

Knowledge on drinking guidelines in Ireland is also poor. In 2012, just 10% of men and 10% of women knew the gender-specific low-risk limits for alcohol consumption.[19] Ireland's guidelines were last reviewed in 2009.[22] The current guidelines recommend that men consume no more than 17 standard drinks and women no more than 11 standard drinks spread over the course of a week, with at least two alcohol free days. No guidance is given in relation to daily low-risk limits. These results suggest that further work on educating the Irish public on low-risk drinking limits is required. Given the high prevalence of frequent RSOD in Ireland it may also be appropriate to introduce low-risk daily limits. Drinkers in Ireland tend to consume alcohol relatively infrequently but, on the occasions that they do, they are likely to engage in RSOD. In order for individuals to monitor and be aware of their alcohol consumption, knowledge on the standard drink concept and low-risk drinking guidelines is required. It is unrealistic to expect people to stay within low-risk limits and to be able to accurately assess their own hazardous or harmful drinking in the absence of knowledge on what actually constitutes hazardous or harmful drinking.

Policy implications

Public health messaging can be utilised to provide health guidance regarding alcohol use to the general public. A systematic review on the effectiveness of mass media public health campaigns to reduce alcohol consumption and related harms found evidence that such campaigns can be recalled by individuals and can achieve improvements in knowledge about alcohol. There was no evidence that campaigns led to decreased alcohol consumption but the authors concluded that mass media can yield sustained knowledge, which may lay the groundwork for reductions in consumption that are achieved using other public health measures.[23] In Denmark, a repeated annual campaign from 1990 to 2000 increased awareness of low-risk drinking guidelines in all subsets of the population throughout the period.[24] Hazardous drinkers were more knowledgeable about the guidelines than low-risk drinkers, which shows that this important target group can be reached. There had been limited public health messaging in Ireland on low-risk drinking prior to 2017, when an alcohol campaign 'Ask About Alcohol' was commenced to provide clear and authoritative information on alcohol to the public across a number of media platforms. The website for this campaign is the first one dedicated to dealing with alcohol to be created by a State body in Ireland. It provides advice on low-risk drinking limits and contains a drinks calculator so the public can understand exactly how much they are drinking and whether it is within low-risk limits.

This study demonstrates that further initiatives to reduce overall consumption and hazardous and harmful drinking patterns and raise awareness around drinking patterns are required. Based on the existing evidence, simply having a public messaging campaign around hazardous and harmful drinking is insufficient to reduce alcohol consumption and problematic patterns of drinking in an alcogenic culture such as Ireland, where pro-alcohol

social norms and alcohol marketing and sponsorship are pervasive. Our results also suggest that there is a cohort of younger, well-educated drinkers in Ireland who also engage in other potentially risky behaviours and that these subjects are already aware of their hazardous or harmful drinking. Consequently, it is unlikely that public health messaging alone will be sufficient to result in behaviour change for this group in relation to their alcohol use. In 2018, following a protracted process, the Public Health (Alcohol) Act was signed into law. This is the first time that Ireland's harmful use of alcohol will be addressed coherently in public health legislation. The main provisions of the Act include the introduction of a minimum unit price for alcohol, restrictions on the advertising and sponsorship of alcohol products, the structural separation of alcohol from other non-alcohol products in small shops, convenience stores and supermarkets, and labelling of all alcohol products to provide consumers with information on the number of grams of alcohol per container, calorific content, and health warnings. These measures will be enacted over the coming years with the aim of reducing alcohol consumption in Ireland. However, it is important that these initiatives are accompanied by public health messaging. If a comprehensive and sustained public health messaging campaign is implemented alongside the provisions in the Public Health Alcohol Act, the likelihood of both raising awareness and achieving meaningful reductions in alcohol consumption and problematic drinking patterns will be increased. It is also imperative that evaluations on the effectiveness of the legislative measures and the public messaging campaign are undertaken regularly to assess their impacts.

Conclusions

The results of this study indicate that a large proportion of Irish drinkers are not aware that they are consuming alcohol in a way that is potentially damaging to their health. It is likely

that sustained public health messaging alongside evidence-based policy measures around pricing, availability, and marketing are required to bring about behaviour change among the Irish drinking population.

Table 1. Sociodemographic and addictive behaviour characteristics of drinkers by drinking pattern.

Weighted count=5144	n	All drinkers	Low-risk drinkers (n=2652)	Regular RSOD drinker (n=1953)	Dependent drinkers (n=539)	P value
		100%	51.6%	38.0%	10.5%	
Gender						
Male	2659	51.7%	37.5%	68.0%	62.8%	<0.001
Female	2485	48.3%	62.6%	32.1%	37.2%	
Age group						
15–24	831	16.2%	11.0%	17.7%	36.5%	<0.001
25–34	1140	22.2%	16.6%	26.4%	34.5%	
35–64	2576	50.2%	56.9%	47.3%	28.1%	
65+	582	11.4%	15.5%	8.6%	0.9%	
Marital status						
Single/never married	1652	32.2%	22.0%	37.9%	61.8%	<0.001
Married/cohabiting	3097	60.3%	69.1%	56.2%	31.8%	
Divorced/separated/ widowed	386	7.5%	8.9%	5.9%	6.5%	
Education						
Primary/none	1099	21.4%	20.3%	23.3%	20.3%	0.0562
Completed secondary	1531	29.8%	28.7%	31.2%	30.4%	
Completed third level	2502	48.8%	51.0%	45.5%	49.4%	
Employment						
Employed	2896	56.3%	53.2%	61.7%	52.0%	<0.001
Unemployed	500	9.7%	7.7%	11.2%	14.4%	
Student	534	10.4%	7.7%	10.4%	23.5%	
Home duties	533	10.4%	15.4%	5.8%	2.4%	
Retired	521	10.1%	13.3%	8.3%	1.1%	
Other	161	3.1%	2.8%	2.6%	6.6%	
Region						
Dublin	1503	29.2%	27.3%	29.1%	38.9%	<0.001

Outside Dublin	3642	70.8%	72.7%	70.9%	61.1%	
Dependent children						
Yes	1977	38.6%	42.6%	37.2%	24.0%	<0.001
Smoking						
Yes	1365	26.5%	18.5%	31.1%	49.6%	<0.001
Illicit drug use						
Yes	483	9.4%	2.8%	11.6%	33.9%	<0.001
Gambling						
Yes	1813	35.3%	26.4%	41.4%	56.6%	<0.001

Table 2. Self-perceived drinking category by drinking pattern.

Weighted count=5,053	**All drinkers** (n=5053)	**Low-risk drinkers** (n=2634)	**Regular RSOD drinkers** (n=1890)	**Dependent drinkers** (n=529)
All drinkers				
Light/moderate (n=3584)	70.9%	83.8%	63.4%	33.8%
Light/moderate and sometimes binge (n=1348)	26.7%	15.9%	35.1%	50.3%
Heavy drinker (n=121)	2.4%	0.3%	1.5%	16.0%
Male drinkers (n=2600)				
Light/moderate (n=1726)	66.4%	82.2%	62.6%	33.5%
Light/moderate and sometimes binge (n=783)	30.1%	17.5%	35.4%	47.7%
Heavy drinker (n=91)	3.5%	0.3%	2.0%	18.7%
Female drinkers (n=2453)				
Light/moderate (n=1859)	75.8%	84.8%	64.9%	34.2%
Light/moderate and sometimes binge (n=565)	23.0%	15.0%	34.6%	54.4%
Heavy drinker (n=30)	1.2%	0.2%	0.5%	11.4%

Table 3. Unadjusted odds ratios for factors associated with self-awareness of hazardous or harmful drinking.

Weighted count=2420	n	Aware of hazardous/ harmful drinking (n=777)	Unaware of hazardous/ harmful drinking (n=1643)	OR	95% CI	P value
Gender						
Female	808	30.4%	34.8%	1	Ref	
Male	1612	69.6%	65.2%	1.22	0.97–1.53	0.084
Age group						
15–24	529	23.1%	21.3%	1	Ref	
25–34	683	36.2%	24.5%	1.36	0.98–1.89	0.065
35–64	1041	37.9%	45.6%	0.77	0.57–1.02	0.069
65+	162	2.8%	8.6%	**0.30**	**0.19–0.48**	**<0.001**
Marital status						
Single/never married	1036	47.0%	41.0%	1	Ref	
Married/cohabiting	1233	47.4%	52.8%	**0.78**	**0.62–0.98**	**0.037**
Divorced/separated/ widowed	145	5.6%	6.2%	0.79	0.54–1.16	0.230
Education						
Primary/none	533	15.3%	25.3%	1	Ref	
Completed secondary	752	29.7%	31.9%	**1.54**	**1.11–2.14**	**0.009**
Completed third level	1128	55.0%	42.9%	**2.12**	**1.58–2.85**	**<0.001**
Employment						
Employed	1448	64.8%	57.5%	1	Ref	
Unemployed	352	15.4%	14.1%	0.97	0.72–1.31	0.842
Student	324	12.5%	13.9%	0.80	0.55–1.16	0.233
Home duties	120	3.2%	5.8%	**0.49**	**0.30–0.80**	**0.004**
Retired	163	3.7%	8.2%	**0.40**	**0.27–0.59**	**<0.001**
Other	13	0.5%	0.6%	0.73	0.22–2.42	0.602
Dependent children						
No	1582	66.7%	65.2%	1	Ref	
Yes	827	33.3%	34.8%	0.93	0.74–1.17	0.545
Region						
Outside Dublin	1652	68.0%	68.4%	1	Ref	

Dublin	768	32.0%	31.6%	1.02	0.79–1.31	0.888
Illicit drug use						
No	2029	78.3%	86.5%	1	Ref	
Yes	391	21.7%	13.5%	**1.78**	**1.31–2.40**	**<0.001**
Smoking						
No	1584	63.4%	66.5%	1	Ref	
Yes	836	36.6%	33.6%	1.14	0.91-1.44	0.254
Gambling						
No	1333	45.9%	59.4%	1	Ref	
Yes	1087	54.1%	40.6%	**1.72**	**1.38–2.15**	**<0.001**

Table results shown in bold are significant (P < 0.05).

Table 4. Adjusted odds ratios for factors associated with self-awareness of hazardous or harmful drinking.

Variables	OR	95% CI	P value	Wald score
Gender				
Female	1	Ref		1.76
Male	1.19	0.92–1.54	0.185	
Age				
15–24	1	Ref		17.26
25–34	1.07	0.71–1.62	0.748	
35–64	0.66	0.43–1.01	0.055	
65+	**0.30**	**0.14–0.65**	**0.002**	
Marital status				
Single/never married	1	Ref		3.22
Married	0.98	0.73–1.32	0.912	
Divorced/separated/ widowed	1.40	0.90–2.18	0.135	
Education				
Primary/none	1	Ref		13.22
Completed secondary	1.36	0.96–1.93	0.079	
Third level	**1.80**	**1.30–2.49**	**<0.001**	
Employment				
Employed	1	Ref		3.95
Unemployed	1.05	0.75–1.49	0.770	
Student	0.70	0.44–1.13	0.142	
Home duties	0.77	0.45–1.33	0.354	
Retired	1.06	0.57–1.95	0.857	
Other	0.52	0.13–2.16	0.371	
Illicit drug use				
No	1	Ref		4.96
Yes	**1.45**	**1.04–2.01**	**0.026**	
Gambling				
No	1	Ref		15.75
Yes	**1.60**	**1.27–2.01**	**<0.001**	

*ORs are adjusted for all other variables in the table.
Table results shown in bold are significant (P < 0.05).

Declarations

Ethics approval and consent to participate: Ethical approval for the 2014/15 Drug Prevalence Survey was granted by the Royal College of Physicians Ireland.

Consent for publication: Not applicable

Availability of data and material: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: None

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Author contributions: DM conceived of the design of the current study. DM & SM performed the data analysis and interpretation. DM drafted the paper and all other authors provided critical revisions. All authors read and approved the final manuscript.

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	#3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	#4	Present key elements of study design early in the paper	5-6
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	5
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers.	6-8

		Give diagnostic criteria, if applicable	
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	6-8
Bias	#9	Describe any efforts to address potential sources of bias	n/a
Study size	#10	Explain how the study size was arrived at	5
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	9
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	9
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	9
Statistical methods	#12c	Explain how missing data were addressed	9
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	9
Statistical methods	#12e	Describe any sensitivity analyses	n/a
Results			
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	10
Participants	#13b	Give reasons for non-participation at each stage	10
Participants	#13c	Consider use of a flow diagram	n/a
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	Table 1
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	10-12
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-12
Main results	#16b	Report category boundaries when continuous variables were categorized	10-12

Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	10-12
Discussion			
Key results	#18	Summarise key results with reference to study objectives	12
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	13-14
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	14
Generalisability	#21	Discuss the generalisability (external validity) of the study results	13, 15
Other Information			
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	22

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Drinking in denial: a cross sectional analysis of national survey data in Ireland to measure drinkers' awareness of their alcohol use

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Title page

Title: **Drinking in denial: a cross sectional analysis of national survey data in Ireland to measure drinkers' awareness of their alcohol use**

Authors:

Deirdre Mongan, Health Research Board, Ireland dmongan@hrb.ie

Seán R. Millar, Health Research Board, Ireland; School of Public Health, University College Cork, Ireland smillar@hrb.ie

Claire O'Dwyer, Health Research Board, Ireland CODwyer@hrb.ie

Jean Long, Health Research Board, Ireland jlong@hrb.ie

Brian Galvin, Health Research Board, Ireland bgalvin@hrb.ie

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Contributorship statement: DM designed the study, analysed the data, and drafted the manuscript. SM provided statistical support and helped interpret the data. COD undertook a review of the literature and provided assistance with data analysis. JL was involved in the design and conception of the study. BG supervised the study. All authors reviewed and helped to revise successive drafts and approved the final version of the manuscript.

Corresponding Author:

Deirdre Mongan, Health Research Board, Ireland; Grattan House 67–72 Lower Mount Street, Dublin 2; Tel: +353-1-2345184 Email: dmongan@hrb.ie

Abstract

Objectives: Ireland has high per capita alcohol consumption and also has high levels of problematic drinking patterns. While it is accepted that patterns of alcohol consumption in Ireland are a cause for concern, it is not clear if Irish people are actually aware of the extent of their hazardous or harmful pattern of drinking. The aim of this study was to determine awareness of drinking pattern in an Irish population using a representative random sample and to identify characteristics associated with self-awareness of hazardous or harmful drinking.

Methods: We analysed data from Ireland's 2014/15 Drug Prevalence Survey which recruited a stratified clustered sample of 7,005 individuals aged 15 years and over living in private households. Logistic regression analysis was used to determine characteristics associated with self-awareness of hazardous or harmful drinking.

Results: Almost one half of drinkers had a hazardous or harmful pattern of drinking; 38% engaged in monthly risky single occasion drinking (RSOD) and 10.5% met DSM-IV for alcohol dependence. Of the 2,420 respondents who had a hazardous or harmful pattern of drinking, 67% were unaware of this and misclassified themselves as being either a light or moderate drinker who did not engage in risky single occasion drinking. An adjusted logistic regression model identified that hazardous and harmful drinkers were more likely to be aware of their drinking pattern if they had completed third level education (OR = 1.80, 95% CI: 1.30–2.49) while older drinkers (aged 65 and over) were less likely to be aware of their drinking pattern (OR = 0.30, 95% CI: 0.14–0.65). Subjects who engaged in risk taking behaviours such as illicit

drug use and gambling were also significantly more likely to be aware of their drinking pattern.

Conclusions: The results of this study suggest that patterns of alcohol use in Ireland are problematic. Older respondents and those with lower educational attainment are less likely to be aware of their hazardous or harmful drinking pattern. There is also a population of younger, more-educated drinkers who engage in potentially risk-taking behaviours and these subjects are aware of their harmful drinking pattern. Initiatives to reduce overall alcohol consumption and raise awareness around drinking patterns are required.

Strengths and limitations of this study

- This was a large national survey which was representative of the Irish population.
- The study employed standardised methods for the measurement of hazardous and harmful alcohol consumption.
- Although the overall response rate was good, alcohol surveys often fail to recruit the heaviest drinkers, resulting in selection bias.
- There were discrepancies between the definitions used to define drinking patterns and the categories that respondents were asked to select from to self-assess their own drinking

Introduction

Alcohol is the seventh leading risk factor for deaths and is responsible for 10% of global deaths annually among those aged 15-49 years.[1] A person's pattern of drinking is an important determinant of alcohol-related harm. While there has traditionally been a focus on overall volume of drinking, greater attention is now being paid to the impact of drinking pattern on harms over and above the effects from total alcohol consumption. Risky single occasion drinking (RSOD), also referred to as binge drinking or heavy episodic drinking, is associated with a number of negative health, social, and economic consequences. Health harms include liver cirrhosis, coronary heart disease, and various types of cancer.[2-4] RSOD may also impair judgement, increasing the likelihood of driving under the influence of alcohol, intentional self-harm, injury, and risky sexual behaviours. It has been described by the World Health Organization as a hazardous pattern of drinking.[4] Alcohol dependence may be described as a harmful pattern of drinking; it is achronic condition and is defined as 'a cluster of physiological, behavioural, and cognitive phenomena in which the use of alcohol takes on a

much higher priority for a given individual than other behaviours that once had greater value'.[5]

Alcohol use in Ireland is characterised by high per capita consumption and a high level of problematic drinking patterns. While surveys consistently report that 20–25% of Irish adults abstain from alcohol,[6, 7] the most recent available figures indicate that Ireland is the sixth heaviest drinking nation among Organisation for Economic Co-operation and Development (OECD) countries in terms of the overall volume of alcohol consumed.[8] The World Health Organization (WHO) reported in 2018 that 41% of all Irish people aged 15 years and over had engaged in heavy episodic drinking or RSOD in the past 30 days, placing Ireland in eighth place among the 194 countries analysed.[4] Three-quarters of all alcohol consumed in Ireland is done so as part of a RSOD session.[6]

While it is accepted that patterns of alcohol consumption in Ireland are a cause for concern, it is not clear if Irish people are actually aware of the extent of their hazardous or harmful pattern of drinking. If it is the case that people are not aware of their drinking pattern this suggests that interventions to increase awareness in Ireland may be required. In Australia, awareness of drinking is low with most people, regardless of their drinking pattern, considering themselves to be an occasional, light or social drinker. Risky drinkers were less likely than low-risk drinkers to be aware of what constituted risky drinking.[9] Irish research indicates that those most likely to experience alcohol-related harm are those who are alcohol dependent followed by those who engage in regular RSOD.[10] Given the relationship between drinking pattern and alcohol-related harm in Ireland, the aim of this study was to determine awareness of drinking patterns in an Irish population using a representative random sample

and to identify characteristics associated with self-awareness of hazardous or harmful drinking.

Methods

Sampling and study population

We analysed data from Ireland's 2014/15 Drug Prevalence Survey. This national survey recruited a stratified clustered sample of 7,005 individuals aged 15 years and over, living in private households in Ireland. The sampling frame used was the GeoDirectory, which is a list of all addresses in the Republic of Ireland, and distinguishes between residential and commercial establishments. A three-stage process was used to construct the sample for this survey. The first stage involved stratifying the population into 10 former health board regions in Ireland. In the second stage of stratification, 421 electoral divisions were selected as the primary sampling units across the 10 former health board regions. Before selection, the primary sampling units were ranked by the following socio-demographic indicators: population density, male unemployment and social class, to ensure that a representative cross-section of areas were included. Finally, in each primary sampling unit, 31 addresses were chosen randomly, and at each address, one person was selected to participate in the survey, using the 'last birthday' rule, whereby, the person whose birthday occurred most recently was selected. The achieved sample was weighted by gender, age and former health board region to maximise its representativeness of the general population. A more comprehensive description of the survey's methodology has been detailed elsewhere.[11] The survey involved a face-to-face interview in the participants' home and a self-completion questionnaire. Respondents also self-completed questions in relation to alcohol dependence and their perception of their own drinking pattern. The home interviews were conducted by

trained interviewers using Computer Assisted Personal Interviewing (CAPI). Interviews were completed between August 2014 and August 2015, and achieved a 61% response rate. No data on non-respondents were collected. The survey was granted ethical approved by the Royal College of Physicians in Ireland and all participants gave written informed consent.

Definitions of drinking patterns

Current drinkers were defined as those who had consumed alcohol at least once in the last 12 months. Non-drinkers, categorised as those who had not consumed alcohol in the past year (n=1,608), were excluded from this study.

Hazardous drinking – Regular RSOD in the past year

There are no internationally agreed definitions on how much alcohol constitutes a RSOD episode or on what is regular RSOD. We defined RSOD as consuming 60g of pure alcohol on a single drinking occasion similar to the WHO definition.[12]. Respondents were asked how often they had consumed the equivalent of six standard drinks on a single drinking occasion in the past year. In Ireland, a standard drink contains 10g of pure alcohol. Frequency of RSOD was measured as follows: daily, 5–6 times a week, 4 times a week, 3 times a week, 2 times a week, once a week, 2–3 times a month, once a month, 6–11 times a year, 2–5 times a year and once a year. The concept of a standard drink and what constitutes 60g of alcohol was explained in detail to each respondent and visual aids were provided depicting 60g of alcohol according to beverage type. We defined hazardous drinkers as those who engaged in RSOD at least monthly in the previous 12 months, but who did not meet the criteria for alcohol dependence (Box 1).

Harmful drinking – alcohol dependence

Alcohol dependence was defined according to DSM-IV criteria, and was measured via self-completed questionnaire using the ten items that denote alcohol dependence from the Composite International Diagnostic Interview, an instrument that is used in many general population studies.[13] Alcohol dependence was established from a positive response in three or more of the seven domains on the DSM-IV diagnostic criteria in the twelve months before the interview.[14] Harmful drinkers were defined as those who met the criteria for alcohol dependence, regardless of their RSOD status. Drinkers who met the criteria for both regular RSOD and alcohol dependence were assigned to the alcohol dependence/harmful drinking type. Respondents who did not have complete data on RSOD and a DSM-IV score (n=236) were excluded from the analysis.

Low-risk drinking

For this study, low-risk drinking was defined as drinking that did not fit our criteria of hazardous or harmful drinking i.e. those drinkers who were not alcohol dependent and who also did not engage in regular RSOD.

Self-perception of own drinking

Drinkers were asked to describe their own drinking by selecting one of the following six statements: '*I am a heavy drinker'; 'I am a heavy drinker and sometimes I binge drink'; 'I am a moderate drinker'; 'I am a moderate drinker and sometimes I binge drink'; 'I am a light drinker';* or *'I am a light drinker and sometimes I binge drink'*. This question was cognitively tested prior to the survey and the wording used reflects the feedback received from the participants following the cognitive testing exercise on their understanding of the terms used.

This question was answered by respondents via self-completed questionnaire. No descriptions of the terms 'light', 'moderate', 'heavy' or 'binge' were provided to respondents. The terms 'light' and 'moderate' were used in this question instead of 'low-risk,' and 'binge' was used instead of RSOD as they are terms typically used by the general public in Ireland. This was also reflected in the cognitive testing of the questionnaire which found that respondents were more familiar with the terms 'light', 'moderate' and 'binge'.. For ease of analysis and to allow us to make comparisons with the three drinking patterns we measured i.e. low-risk, hazardous, and harmful drinking, we collapsed the six statements into three groups. We combined the categories '*I am a light drinker*' and '*I am a moderate drinker*'; the categories '*I am a light drinker and sometimes I binge drink*' and '*I am a moderate drinker and sometimes I binge drink*'; and the categories '*I am a heavy drinker*' and '*I am a heavy drinker and sometimes I binge drink*'. We then compared respondents' self-perception of their own drinking against their drinking patterns as measured elsewhere in the questionnaire through the RSOD and DSM-IV questions (Box 2).

Awareness of hazardous and harmful drinking

For this part of the analysis we only included those respondents who were classified as hazardous/RSOD or harmful/dependant drinkers (n=2,420). Respondents were considered to be unaware of their own hazardous and harmful drinking if they incorrectly underestimated their drinking pattern i.e. those regular RSOD drinkers who classified themselves as light or moderate drinkers who do not binge drink and dependent drinkers who classified themselves as light or moderate drinkers who may or may not sometimes binge drink. Respondents were considered to be aware of their own hazardous or harmful drinking pattern if they described themselves as sometimes binge drinking or as a heavy drinker.

Statistical analysis

The distribution of drinking pattern was analysed by socio-demographic and addictive behaviour variables that are associated with alcohol. The socio-demographic variables analysed were age, sex, marital status, education, employment, region, dependent children; and the addictive behaviour variables analysed were smoking status (defined as being a current smoker), last year gambling (excluding lottery), and last year illicit drug use. This was analysed by cross-tabulation and statistical significance was assessed by the Pearson χ^2 test. Cross-tabulation was used to compare the drinking pattern of respondents as measured using the RSOD and DSM-IV questions to their self-perceived drinking pattern.

Univariate logistic regression analyses were performed to determine factors associated with self-awareness of drinking pattern. Those variables which were identified as being significant or borderline significant (P<0.1) were then entered into a multivariable logistic regression model which was used to estimate adjusted odds ratios of being self-aware of hazardous or harmful drinking. This model was adjusted for gender, age, marital status, education, employment, illicit drug use, and gambling. The ability of variables identified in multivariable analysis to separate cases from non-cases was evaluated using the *c* statistic. For all analyses, a P value of less than 0.05 was considered to indicate statistical significance. Data were analysed using Stata Version 15.1 (Stata Corporation, College Station, TX, USA). Results are displayed using weighted data.

Results

Drinking patterns of respondents

Of the 7,005 survey respondents, 5,397 (77.0%, 95% CI: 75.7–78.3) had consumed alcohol in the last year; among current, or last year drinkers, a drinking pattern could be assigned to 5,144. Just over half (51.6%, 95% CI: 49.9–53.2) of drinkers were low-risk drinkers, 38% (95% CI: 36.4–39.6) engaged in regular RSOD, and 10.5% (95% CI: 9.4–11.6) were dependent drinkers. Table 1 presents the characteristics of drinkers by drinking pattern. Men accounted for 51.7% of drinkers, 56.3% of drinkers were employed and 48.8% had completed third level education. Low-risk drinkers were predominantly female, aged over 35 years and married. The characteristics of regular RSOD and dependent drinkers were similar; they were more likely to be male, young and single. Low-risk drinkers were most likely to have dependent children (42.6%). The likelihood of engaging in other addictive behaviours increased as hazardous/harmful drinking pattern increased. Smoking was observed in 18.5% of low-risk drinkers, compared to 31.1% of RSOD drinkers and 49.6% of dependent drinkers. Illicit drug use was observed in 2.8% of low-risk drinkers, 11.6% of RSOD drinkers and 33.9% of dependent drinkers, while the respective figures for gambling were 26.4%, 41.4% and 56.6%. The three drinking pattern categories differed with statistical significance for all variables with the exception of education.

Self-perception of own drinking and comparison with own drinking pattern

Information on drinking pattern and self-defined drinking category was available for 5,053 respondents. The majority of drinkers (70.9%) classified themselves as light or moderate drinkers who do not binge drink, 26.7% categorised themselves as light or moderate drinkers who sometimes binge drink, and 2.4% classified themselves as heavy drinkers (Table 2). Most low-risk drinkers (83.8%) described themselves as light or moderate drinkers. Almost two-thirds of regular RSOD drinkers and one-third (33.8%) of dependent drinkers described

themselves as light or moderate drinkers. Just 35.1% of regular RSOD drinkers stated that they sometimes engaged in binge drinking and just 16% of dependent drinkers described themselves as a heavy drinker. A similar trend was observed among males and females. However, dependent female drinkers were less likely than males to describe themselves as a heavy drinker (11.4% vs. 18.7%). There were 426 (16.2%) low-risk drinkers and 29 (1.5%) regular RSOD drinkers who over-estimated their drinking pattern.

Awareness of own drinking among hazardous/harmful drinkers

Of those who had a hazardous or harmful pattern of drinking (n=2,420), 67.9% were unaware of this and misclassified themselves as being either a light or moderate drinker. Self-awareness of hazardous or harmful drinking pattern by socio-economic demographics and other addictive behaviours is presented in Table 3. In unadjusted analyses, respondents who were younger, who had completed secondary or third level education, and those who had engaged in illicit drug use and gambling in the previous year were significantly more likely to be aware that their drinking pattern was hazardous or harmful. Survey participants who were older, married and who were engaged in home duties or retired were significantly less likely to be aware that their drinking pattern was hazardous or harmful.

An adjusted logistic regression model identified that respondents aged 65 years and over were 0.3 times (95% CI: 0.14–0.65) as likely to be aware of their hazardous or harmful drinking pattern compared to those aged 15–24 years (Table 4). Higher education was also associated with self-awareness of hazardous or harmful drinking in multivariable analysis, with those who had completed third level education being 1.8 times (95% CI: 1.30–4.60) more likely to be aware compared to those who had completed primary education only. Participants who

were aware of their hazardous or harmful drinking pattern were also more likely to engage in illicit drug use (OR = 1.45, 95% CI: 1.04–2.01) or to gamble (OR = 1.60, 95% CI: 1.27–2.01). The *c* statistic for a model which included these variables was 0.65 (95% CI: 0.63–0.68).

Patient and public involvement

No patient involved.

Discussion

Main findings of the study

The results of this nationally representative study of 7,005 respondents suggest that patterns of alcohol use in Ireland are problematic. Almost half of all drinkers either engage in frequent RSOD (38%) or score positive for alcohol dependence (10.5%). In addition to hazardous and harmful drinking patterns being commonplace in Ireland, this study finds that a majority of those who engage in such patterns of drinking are unaware of this. Low-risk drinkers were mostly aware of their own pattern of drinking, although 16.2% overestimated their drinking pattern. In comparison, awareness of drinking pattern was low for regular RSOD drinkers and for dependent drinkers. One-third (33.8%) of drinkers with a positive DSM-IV score self-categorised themselves as being either a light or moderate drinker and a further 50.3% described themselves as a light or moderate drinker who sometimes binge drinks. Given that alcohol dependence is a maladaptive pattern of alcohol consumption, manifested by symptoms leading to clinically significant impairment[15], it is particularly concerning that so many Irish people with alcohol dependence believe themselves to be light or moderate drinkers. Our adjusted regression analysis found that factors independently associated with self-awareness of hazardous or harmful drinking pattern were having a higher educational

level and engaging in risk taking behaviours, such as illicit drug use and gambling, while those aged 65 and over were significantly less likely to be aware of their hazardous or harmful drinking pattern. Nevertheless, the *c* statistic demonstrated that the ability of our model to separate cases from non-cases was poor. This indicates that there are likely to be other factors which we have not identified that are associated with awareness of drinking pattern in this population. It is possible that factors not included in this survey such as personality traits may be associated with awareness of drinking pattern and further research is required to identify these factors.

Strengths and limitations

To the best of our knowledge this is the first study to attempt to identify factors associated with the public's self-perception of their own drinking with their actual drinking pattern using a general population survey. A further strength is that the survey had a large sample size of 7,005, and respondents were selected using a random probability sample that was representative of the Irish population; thus our findings are generalisable to the whole population. We also used valid and reliable measures of hazardous and harmful alcohol consumption, namely the frequency of RSOD and the DSM-IV questionnaire.

However, this study has a number of limitations which need to be considered when interpreting the findings. While our results are nationally representative, response bias may also be considered a limitation; general population surveys such as this often fail to recruit the heaviest drinkers, as they may be difficult to contact and if contacted may be less likely to agree to participate.[16] Only a limited number of alcohol questions were included in this survey and they used a 12-month reference period, which may lead to reduced recall for

respondents. Self-reporting biases are common to alcohol use surveys and lead to underestimation of alcohol consumption. The usual range of coverage from surveys is in the region of 40–60%.[17, 18] In a 2013 Irish population survey, self-reported alcohol consumption based on 'typical drink questions' accounted for just 39% of per capita sales, even though the concept of a standard drink was explained in detail to each respondent and visual aids were provided.[6] Finally, there were discrepancies between the definitions used to define drinking patterns and the categories that respondents were asked to select from to self-assess their own drinking. However, it was felt that the alcohol terms typically used in clinical and research settings would not be as easily understood by the general public, and this was corroborated by the cognitive testing of the questionnaire that was undertaken prior to the survey.

Comparison with previous work

In relation to drinking patterns, the results of this study suggest that Ireland has a high level of RSOD when compared to other countries[4]. The prevalence of alcohol dependence in this study was also high when compared to a study of alcohol dependence in European countries, although it should be noted that a number of different instruments were used to measure dependence in the European report.[19]

The available evidence suggests that knowledge on standard drinks and drinking guidelines both in Ireland and internationally is limited, which may help explain why so few respondents correctly identified their pattern of drinking. Our findings regarding awareness of hazardous and harmful drinking are similar to a recent study in Australia, which reported that 68% of Australian drinkers who consume 11 or more standard drinks on a 'typical occasion' consider themselves a 'responsible drinker'.[20] A Swedish study reported low levels of knowledge of

standard drink and hazardous drinking concepts among hazardous drinkers.[21] A review of the literature on standard drinks for the European Joint Action on Alcohol found little understanding of what the term 'standard drink' actually means and that drinkers are not able to define standard drinks accurately.[22] A 2012 Irish survey demonstrated that while 58% had heard of the term 'standard drink', just 39% knew how many standard drinks are in a pint of lager and 33% knew how many standard drinks are in a single measure of spirits, which are the typical serving sizes of lager and spirits in Ireland.[23] In the UK, knowledge of the previous drinking guidelines was poor, in spite of them having been in place for 20 years. In 2012, only about one-quarter of people were able to provide a correct estimate of how many units it was recommended their gender should not exceed in a day, which corresponded to a lower level of awareness than in 2009. This suggests that previous efforts to raise awareness of recommended drinking limits have not had lasting effect.[24] In Australia 53.5% correctly identified the guideline threshold for women and 20.3% did so for men.[25]

Knowledge on drinking guidelines in Ireland is also poor. In 2012, just 10% of men and 10% of women knew the gender-specific low-risk limits for alcohol consumption.[23] Ireland's guidelines were last reviewed in 2009.[26] The current guidelines recommend that men consume no more than 17 standard drinks and women no more than 11 standard drinks spread over the course of a week, with at least two alcohol free days. No guidance is given in relation to daily low-risk limits. These results suggest that further work on educating the Irish public on low-risk drinking limits is required. Given the high prevalence of frequent RSOD in Ireland it may also be appropriate to introduce low-risk daily limits. Drinkers in Ireland tend to consume alcohol relatively infrequently but, on the occasions that they do, they are likely to engage in RSOD. In order for individuals to monitor and be aware of their alcohol

consumption, knowledge on the standard drink concept and low-risk drinking guidelines is required. It is unrealistic to expect people to stay within low-risk limits and to be able to accurately assess their own hazardous or harmful drinking in the absence of knowledge on what actually constitutes hazardous or harmful drinking.

Policy implications

Public health messaging can be utilised to provide health guidance regarding alcohol use to the general public. A systematic review on the effectiveness of mass media public health campaigns to reduce alcohol consumption and related harms found evidence that such campaigns can be recalled by individuals and can achieve improvements in knowledge about alcohol. There was no evidence that campaigns led to decreased alcohol consumption but the authors concluded that mass media can yield sustained knowledge, which may lay the groundwork for reductions in consumption that are achieved using other public health measures.[27] In Denmark, a repeated annual campaign from 1990 to 2000 increased awareness of low-risk drinking guidelines in all subsets of the population throughout the period.[28] Hazardous drinkers were more knowledgeable about the guidelines than low-risk drinkers, which shows that this important target group can be reached. There had been limited public health messaging in Ireland on low-risk drinking prior to 2017, when an alcohol campaign 'Ask About Alcohol' was commenced to provide clear and authoritative information on alcohol to the public across a number of media platforms. The website for this campaign is the first one dedicated to dealing with alcohol to be created by a State body in Ireland. It provides advice on low-risk drinking limits and contains a drinks calculator so the public can understand exactly how much they are drinking and whether it is within low-risk limits.

This study demonstrates that further initiatives to reduce overall consumption and hazardous and harmful drinking patterns and raise awareness around drinking patterns are required. Based on the existing systematic review evidence on mass media campaigns,[27] simply having a public messaging campaign around hazardous and harmful drinking is insufficient to reduce alcohol consumption and problematic patterns of drinking in an alcogenic culture such as Ireland, where pro-alcohol social norms and alcohol marketing and sponsorship are pervasive. Older people and those with lower educational attainment were less likely to be aware of their hazardous or harmful drinking and efforts should be made to target this group in relation to raising awareness around alcohol use. Our results also suggest that there is a cohort of younger, well-educated drinkers in Ireland who also engage in other potentially risky behaviours and that these subjects are already aware of their hazardous or harmful drinking. Consequently, it is unlikely that public health messaging alone will be sufficient to result in behaviour change for this group in relation to their alcohol use. In 2018, following a protracted process, the Public Health (Alcohol) Act was signed into law. This is the first time that Ireland's harmful use of alcohol will be addressed coherently in public health legislation. The main provisions of the Act include the introduction of a minimum unit price for alcohol, restrictions on the advertising and sponsorship of alcohol products, the structural separation of alcohol from other non-alcohol products in small shops, convenience stores and supermarkets, and labelling of all alcohol products to provide consumers with information on the number of grams of alcohol per container, calorific content, and health warnings. These measures will be enacted over the coming years with the aim of reducing alcohol consumption in Ireland. However, it is important that these initiatives are accompanied by public health messaging. If a comprehensive and sustained public health messaging campaign is implemented alongside the provisions in the Public Health Alcohol Act, the likelihood of

both raising awareness and achieving meaningful reductions in alcohol consumption and problematic drinking patterns will be increased. It is also imperative that evaluations on the effectiveness of the legislative measures and the public messaging campaign are undertaken regularly to assess their impacts.

Conclusions

The results of this study indicate that a large proportion of Irish drinkers are not aware that they are consuming alcohol in a way that is potentially damaging to their health. It is likely that sustained public health messaging alongside evidence-based policy measures around pricing, availability, and marketing are required to bring about behaviour change among the Irish drinking population.

Table 1. Sociodemographic and addictive behaviour characteristics of drinkers by drinking pattern.

Weighted count=5144	All drinkers	Low-risk drinkers N (%)	Regular RSOD drinker N (%)	Dependent drinkers N (%)	P value
	5144 (100)	2652 (51.6)	1953 (38.0)	539 (10.5)	
Gender					
Male	2659 (51.7)	993 (37.5)	1327 (68.0)	339 (62.8)	<0.001
Female	2485 (48.3)	1659 (62.6)	626 (32.1)	200 (37.2)	
Age group					
15–24	831 (16.2)	290 (11.0)	344 (17.7)	197 (36.5)	<0.001
25–34	1140 (22.2)	439 (16.6)	515 (26.4)	186 (34.5)	
35–64	2576 (50.2)	1503 (56.9)	921 (47.3)	152 (28.1)	
65+	582 (11.4)	411 (15.5)	167 (8.6)	5 (0.9)	
Marital status					
Single/never married	1652 (32.2)	583 (22.0)	739 (37.9)	330 (61.8)	<0.001
Married/cohabiting	3097 (60.3)	1830 (69.1)	1097 (56.2)	170 (31.8)	
Divorced/separated/ widowed	386 (7.5)	235 (8.9)	116 (5.9)	35 (6.5)	
Education					
Primary/none	1099 (21.4)	537 (20.3)	453 (23.3)	109 (20.3)	0.0562
Completed secondary	1531 (29.8)	760 (28.7)	608 (31.2)	163 (30.4)	
Completed third level	2502 (48.8)	1351 (51.0)	886 (45.5)	265 (49.4)	
Employment					
Employed	2896 (56.3)	1410 (53.2)	1205 (61.7)	280 (52.0)	<0.001
Unemployed	500 (9.7)	203 (7.7)	219 (11.2)	78 (14.4)	

Student	534 (10.4)	204 (7.7)	203 (10.4)	127 (23.5)	
Home duties	533 (10.4)	407 (15.4)	113 (5.8)	13 (2.4)	
Retired	521 (10.1)	353 (13.3)	163 (8.3)	6 (1.1)	
Other	161 (3.1)	75 (2.8)	51 (2.6)	35 (6.6)	
Region					
Dublin	1503 (29.2)	724 (27.3)	569 (29.1)	210 (38.9)	<0.001
Outside Dublin	3642 (70.8)	1928 (72.7)	1384 (70.9)	329 (61.1)	
Dependent children					
Yes	1977 (38.6)	1124 (42.6)	725 (37.2)	128 (24.0)	<0.001
Smoking					
Yes	1365 (26.5)	490 (18.5)	607 (31.1)	268 (49.6)	<0.001
Illicit drug use					
Yes	483 (9.4)	75 (2.8)	226 (11.6)	182 (33.9)	<0.001
Gambling					
Yes	1813 (35.3)	699 (26.4)	809 (41.4)	305 (56.6)	<0.001

Numbers may not add up to the column totals because of missing data

Table 2. Self-perceived drinking category by drinking pattern.

Weighted count=5,053	**All drinkers** (n=5053)	**Low-risk drinkers** (n=2634)	**Regular RSOD drinkers** (n=1890)	**Dependent drinkers** (n=529)
All drinkers				
Light/moderate	3584 (70.9)	2208 (83.8)	1198 (63.4)	179 (33.8)
Light/moderate and sometimes binge	1348 (26.7)	419 (15.9)	663 (35.1)	266 (50.3)
Heavy drinker	121 (2.4)	7 (0.3)	29 (1.5)	85 (16.0)
Male drinkers				
Light/moderate	1726 (66.4)	812 (82.2)	802 (62.6)	111 (33.5)
Light/moderate and sometimes binge	783 (30.1)	172 (17.5)	453 (35.4)	159 (47.7)
Heavy drinker	91 (3.5)	3 (0.3)	26 (2.0)	62 (18.7)
Female drinkers				
Light/moderate	1859 (75.8)	1395 (84.8)	395 (64.9)	68(34.2)
Light/moderate and sometimes binge	565(23.0)	246 (15.0)	210 (34.6)	108 (54.4)
Heavy drinker	30 (1.2)	4 (0.2)	3 (0.5)	23 (11.4)

Table 3. Unadjusted odds ratios for factors associated with self-awareness of hazardous or harmful drinking.

Weighted count=2420	n	Aware of hazardous/ harmful drinking (n=777)	Unaware of hazardous/ harmful drinking (n=1643)	OR	95% CI	P value
Gender						
Female	808	236 (30.4)	572 (34.8)	1	Ref	
Male	1612	541 (69.6)	1071 (65.2)	1.22	0.97–1.53	0.084
Age group						
15–24	529	180 (23.1)	349 (21.3)	1	Ref	
25–34	683	282 (36.2)	401 (24.5)	1.36	0.98–1.89	0.065
35–64	1041	294 (37.9)	747 (45.6)	0.77	0.57–1.02	0.069
65+	162	22 (2.8)	140 (8.6)	**0.30**	**0.19–0.48**	**<0.001**
Marital status						
Single/never married	1036	364 (47.0)	672 (41.0)	1	Ref	
Married/cohabiting	1233	367(47.4)	866 (52.8)	**0.78**	**0.62–0.98**	**0.037**
Divorced/separated/ widowed	145	44 (5.6)	101 (6.2)	0.79	0.54–1.16	0.230
Education						
Primary/none	533	119 (15.3)	414 (25.3)	1	Ref	
Completed secondary	752	231 (29.7)	521 (31.9)	**1.54**	**1.11–2.14**	**0.009**
Completed third level	1128	427 (55.0)	701 (42.9)	**2.12**	**1.58–2.85**	**<0.001**
Employment						
Employed	1448	503 (64.8)	945 (57.5)	1	Ref	
Unemployed	352	120 (15.4)	232 (14.1)	0.97	0.72–1.31	0.842
Student	324	97 (12.5)	228 (13.9)	0.80	0.55–1.16	0.233
Home duties	120	25 (3.2)	95 (5.8)	**0.49**	**0.30–0.80**	**0.004**
Retired	163	29 (3.7)	134 (8.2)	**0.40**	**0.27–0.59**	**<0.001**
Other	13	4 (0.5)	9 (0.6)	0.73	0.22–2.42	0.602
Dependent children						
No	1582	518 (66.7)	1065 (65.2)	1	Ref	
Yes	827	258 (33.3)	569 (34.8)	0.93	0.74–1.17	0.545
Region						
Outside Dublin	1652	528 (68.0)	1123 (68.4)	1	Ref	
Dublin	768	249 (32.0)	519 (31.6)	1.02	0.79–1.31	0.888
Illicit drug use						
No	2029	608 (78.3)	1420 (86.5)	1	Ref	
Yes	391	169 (21.7)	222 (13.5)	**1.78**	**1.31–2.40**	**<0.001**
Smoking						
No	1584	493 (63.4)	1091 (66.5)	1	Ref	
Yes	836	284 (36.6)	551 (33.6)	1.14	0.91-1.44	0.254
Gambling						
No	1333	357 (45.9)	976 (59.4)	1	Ref	
Yes	1087	420 (54.1)	667 (40.6)	**1.72**	**1.38–2.15**	**<0.001**

Numbers may not add up to the column totals because of missing data
Table results shown in bold are significant (P < 0.05).

Table 4. Adjusted odds ratios for factors associated with self-awareness of hazardous or harmful drinking.

Variables	OR	95% CI	P value	Wald score
Gender				
Female	1	Ref		1.76
Male	1.19	0.92–1.54	0.185	
Age				
15–24	1	Ref		17.26
25–34	1.07	0.71–1.62	0.748	
35–64	0.66	0.43–1.01	0.055	
65+	**0.30**	**0.14–0.65**	**0.002**	
Marital status				
Single/never married	1	Ref		3.22
Married	0.98	0.73–1.32	0.912	
Divorced/separated/ widowed	1.40	0.90–2.18	0.135	
Education				
Primary/none	1	Ref		13.22
Completed secondary	1.36	0.96–1.93	0.079	
Third level	**1.80**	**1.30–2.49**	**<0.001**	
Employment				
Employed	1	Ref		3.95
Unemployed	1.05	0.75–1.49	0.770	
Student	0.70	0.44–1.13	0.142	
Home duties	0.77	0.45–1.33	0.354	
Retired	1.06	0.57–1.95	0.857	
Other	0.52	0.13–2.16	0.371	
Illicit drug use				
No	1	Ref		4.96
Yes	**1.45**	**1.04–2.01**	**0.026**	
Gambling				
No	1	Ref		15.75
Yes	**1.60**	**1.27–2.01**	**<0.001**	

*ORs are adjusted for all other variables in the table.
Table results shown in bold are significant (P < 0.05).

Box 1: Drinking pattern assigned to drinkers

Low-risk – drinkers who did not meet the criteria for alcohol dependence and who had not engaged in monthly RSOD in the past year

Hazardous – drinkers who had engaged in RSOD at least monthly, but did not meet the criteria for alcohol dependence in the past year

Harmful – drinkers who met the DSM-IV criteria for dependence in the past year

Box 2: Self-perception of own drinking

Light/moderate – those who selected one of these statements: '*I am a light drinker*' or '*I am a moderate drinker*'

Light/moderate and sometimes binge drink – those who selected one of these statements: '*I am a light drinker and sometimes I binge drink*' or '*I am a moderate drinker and sometimes I binge drink*'

Heavy – those who selected one of these statements: '*I am a heavy drinker*' or *'I am a heavy drinker and sometimes I binge drink'*

Declarations

Ethics approval and consent to participate: Ethical approval for the 2014/15 Drug Prevalence Survey was granted by the Royal College of Physicians Ireland (Ref: RECSAF 21).

Consent for publication: Not applicable

Availability of data and material: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: None

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Authors' contributions: DM designed the study, analysed the data, and drafted the manuscript. SM provided statistical support and helped interpret the data. COD undertook a review of the literature and provided assistance with data analysis. JL was involved in the design and conception of the study. BG supervised the study. All authors reviewed and helped to revise successive drafts and approved the final version of the manuscript.

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Reporting checklist for cross sectional study.

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	#3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	#4	Present key elements of study design early in the paper	5-6
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	5
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers.	6-8

		Give diagnostic criteria, if applicable	
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	6-8
Bias	#9	Describe any efforts to address potential sources of bias	n/a
Study size	#10	Explain how the study size was arrived at	5
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	9
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	9
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	9
Statistical methods	#12c	Explain how missing data were addressed	9
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	9
Statistical methods	#12e	Describe any sensitivity analyses	n/a
Results			
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	10
Participants	#13b	Give reasons for non-participation at each stage	10
Participants	#13c	Consider use of a flow diagram	n/a
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	Table 1
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	10-12
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-12
Main results	#16b	Report category boundaries when continuous variables were categorized	10-12

Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
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Drinking in denial: a cross sectional analysis of national survey data in Ireland to measure drinkers' awareness of their alcohol use

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Title page

Title: **Drinking in denial: a cross sectional analysis of national survey data in Ireland to measure drinkers' awareness of their alcohol use**

Authors:

Deirdre Mongan, Health Research Board, Ireland dmongan@hrb.ie

Seán R. Millar, Health Research Board, Ireland; School of Public Health, University College Cork, Ireland smillar@hrb.ie

Claire O'Dwyer, Health Research Board, Ireland CODwyer@hrb.ie

Jean Long, Health Research Board, Ireland jlong@hrb.ie

Brian Galvin, Health Research Board, Ireland bgalvin@hrb.ie

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Corresponding Author:

Deirdre Mongan, Health Research Board, Ireland; Grattan House 67–72 Lower Mount Street, Dublin 2; Tel: +353-1-2345184 Email: dmongan@hrb.ie

Abstract

Objectives: Ireland has high per capita alcohol consumption and also has high levels of problematic drinking patterns. While it is accepted that patterns of alcohol consumption in Ireland are a cause for concern, it is not clear if Irish people are actually aware of the extent of their hazardous or harmful pattern of drinking. The aim of this study was to determine awareness of drinking pattern in an Irish population using a representative random sample and to identify characteristics associated with self-awareness of hazardous or harmful drinking.

Methods: We analysed data from Ireland's 2014/15 Drug Prevalence Survey which recruited a stratified clustered sample of 7,005 individuals aged 15 years and over living in private households. Logistic regression analysis was used to determine characteristics associated with self-awareness of hazardous or harmful drinking.

Results: Almost one half of drinkers had a hazardous or harmful pattern of drinking; 38% engaged in monthly risky single occasion drinking (RSOD) and 10.5% met DSM-IV for alcohol dependence. Of the 2,420 respondents who had a hazardous or harmful pattern of drinking, 67% were unaware of this and misclassified themselves as being either a light or moderate drinker who did not engage in risky single occasion drinking. An adjusted logistic regression model identified that hazardous and harmful drinkers were more likely to be aware of their drinking pattern if they had completed third level education (OR = 1.80, 95% CI: 1.30–2.49) while older drinkers (aged 65 and over) were less likely to be aware of their drinking pattern (OR = 0.30, 95% CI: 0.14–0.65). Subjects who engaged in risk taking behaviours such as illicit

drug use and gambling were also significantly more likely to be aware of their drinking pattern.

Conclusions: The results of this study suggest that patterns of alcohol use in Ireland are problematic. Older respondents and those with lower educational attainment are less likely to be aware of their hazardous or harmful drinking pattern. There is also a population of younger, more-educated drinkers who engage in potentially risk-taking behaviours and these subjects are aware of their harmful drinking pattern. Initiatives to reduce overall alcohol consumption and raise awareness around drinking patterns are required.

Strengths and limitations of this study

- This was a large national survey which was representative of the Irish population.
- The study employed standardised methods for the measurement of hazardous and harmful alcohol consumption.
- Although the overall response rate was good, alcohol surveys often fail to recruit the heaviest drinkers, resulting in selection bias.
- There were discrepancies between the definitions used to define drinking patterns and the categories that respondents were asked to select from to self-assess their own drinking

Introduction

Alcohol is the seventh leading risk factor for deaths and is responsible for 10% of global deaths annually among those aged 15-49 years.[1] A person's pattern of drinking is an important determinant of alcohol-related harm. While there has traditionally been a focus on overall volume of drinking, greater attention is now being paid to the impact of drinking pattern on harms over and above the effects from total alcohol consumption. Risky single occasion drinking (RSOD), also referred to as binge drinking or heavy episodic drinking, is associated with a number of negative health, social, and economic consequences. Health harms include liver cirrhosis, coronary heart disease, and various types of cancer.[2-4] RSOD may also impair judgement, increasing the likelihood of driving under the influence of alcohol, intentional self-harm, injury, and risky sexual behaviours. It has been described by the World Health Organization as a hazardous pattern of drinking.[4] Alcohol dependence may be described as a harmful pattern of drinking; it is a chronic condition and is defined as 'a cluster of physiological, behavioural, and cognitive phenomena in which the use of alcohol takes on a much higher priority for a given individual than other behaviours that once had greater value'.[5]

Alcohol use in Ireland is characterised by high per capita consumption and a high level of problematic drinking patterns. While surveys consistently report that 20–25% of Irish adults abstain from alcohol,[6, 7] the most recent available figures indicate that Ireland is the sixth heaviest drinking nation among Organisation for Economic Co-operation and Development (OECD) countries in terms of the overall volume of alcohol consumed.[8] The World Health Organization (WHO) reported in 2018 that 41% of all Irish people aged 15 years and over had engaged in heavy episodic drinking or RSOD in the past 30 days, placing Ireland in eighth place

among the 194 countries analysed.[4] Three-quarters of all alcohol consumed in Ireland is done so as part of a RSOD session.[6]

While it is accepted that patterns of alcohol consumption in Ireland are a cause for concern, it is not clear if Irish people are actually aware of the extent of their hazardous or harmful pattern of drinking. If it is the case that people are not aware of their drinking pattern this suggests that interventions to increase awareness in Ireland may be required. In Australia, awareness of drinking is low with most people, regardless of their drinking pattern, considering themselves to be an occasional, light or social drinker. Risky drinkers were less likely than low-risk drinkers to be aware of what constituted risky drinking.[9] Irish research indicates that those most likely to experience alcohol-related harm are those who are alcohol dependent followed by those who engage in regular RSOD.[10] Given the relationship between drinking pattern and alcohol-related harm in Ireland, the aim of this study was to determine awareness of drinking patterns in an Irish population using a representative random sample and to identify characteristics associated with self-awareness of hazardous or harmful drinking.

Methods

Sampling and study population

We analysed data from Ireland's 2014/15 Drug Prevalence Survey. This national survey recruited a stratified clustered sample of 7,005 individuals aged 15 years and over, living in private households in Ireland. The sampling frame used was the GeoDirectory, which is a list of all addresses in the Republic of Ireland, and distinguishes between residential and commercial establishments. A three-stage process was used to construct the sample for this

survey. The first stage involved stratifying the population into 10 former health board regions in Ireland. In the second stage of stratification, 421 electoral divisions were selected as the primary sampling units across the 10 former health board regions. Before selection, the primary sampling units were ranked by the following socio-demographic indicators: population density, male unemployment and social class, to ensure that a representative cross-section of areas were included. Finally, in each primary sampling unit, 31 addresses were chosen randomly, and at each address, one person was selected to participate in the survey, using the 'last birthday' rule, whereby, the person whose birthday occurred most recently was selected. The achieved sample was weighted by gender, age and former health board region to maximise its representativeness of the general population. A more comprehensive description of the survey's methodology has been detailed elsewhere.[11] The survey involved a face-to-face interview in the participants' home and a self-completion questionnaire. Respondents also self-completed questions in relation to alcohol dependence and their perception of their own drinking pattern. The home interviews were conducted by trained interviewers using Computer Assisted Personal Interviewing (CAPI). Interviews were completed between August 2014 and August 2015, and achieved a 61% response rate. No data on non-respondents were collected. The survey was granted ethical approved by the Royal College of Physicians in Ireland and all participants gave written informed consent.

Definitions of drinking patterns

Current drinkers were defined as those who had consumed alcohol at least once in the last 12 months. Non-drinkers, categorised as those who had not consumed alcohol in the past year (n=1,608), were excluded from this study.

Hazardous drinking – Regular RSOD in the past year

There are no internationally agreed definitions on how much alcohol constitutes a RSOD episode or on what is regular RSOD. RSOD is referred to as 'heavy episodic drinking' by the World Health Organization, and is also commonly known as 'binge drinking'. We defined RSOD as consuming 60g of pure alcohol on a single drinking occasion similar to the WHO definition.[12] Respondents were asked how often they had consumed the equivalent of six standard drinks on a single drinking occasion in the past year. In Ireland, a standard drink contains 10g of pure alcohol. Frequency of RSOD was measured as follows: daily, 5–6 times a week, 4 times a week, 3 times a week, 2 times a week, once a week, 2–3 times a month, once a month, 6–11 times a year, 2–5 times a year and once a year. The concept of a standard drink and what constitutes 60g of alcohol was explained in detail to each respondent and visual aids were provided depicting 60g of alcohol according to beverage type. We defined hazardous drinkers as those who engaged in RSOD at least monthly in the previous 12 months, but who did not meet the criteria for alcohol dependence (Box 1).

Harmful drinking – alcohol dependence

Alcohol dependence was defined according to DSM-IV criteria, and was measured via self-completed questionnaire using the ten items that denote alcohol dependence from the Composite International Diagnostic Interview, an instrument that is used in many general population studies.[13] Alcohol dependence was established from a positive response in three or more of the seven domains on the DSM-IV diagnostic criteria in the twelve months before the interview.[14] Harmful drinkers were defined as those who met the criteria for alcohol dependence, regardless of their RSOD status. Drinkers who met the criteria for both regular RSOD and alcohol dependence were assigned to the alcohol dependence/harmful drinking

type. Respondents who did not have complete data on RSOD and a DSM-IV score (n=236) were excluded from the analysis.

Low-risk drinking

For this study, low-risk drinking was defined as drinking that did not fit our criteria of hazardous or harmful drinking i.e. those drinkers who were not alcohol dependent and who also did not engage in regular RSOD.

Self-perception of own drinking

Drinkers were asked to describe their own drinking by selecting one of the following six statements: '*I am a heavy drinker'; 'I am a heavy drinker and sometimes I binge drink'; 'I am a moderate drinker'; 'I am a moderate drinker and sometimes I binge drink'; 'I am a light drinker';* or *'I am a light drinker and sometimes I binge drink'*. This question was cognitively tested prior to the survey and the wording used reflects the feedback received from the participants following the cognitive testing exercise on their understanding of the terms used. This question was answered by respondents via self-completed questionnaire. No descriptions of the terms 'light', 'moderate', 'heavy' or 'binge' were provided to respondents. The terms 'light' and 'moderate' were used in this question instead of 'low-risk,' and 'binge' was used instead of RSOD as they are terms typically used by the general public in Ireland. This was also reflected in the cognitive testing of the questionnaire which found that respondents were more familiar with the terms 'light', 'moderate' and 'binge'. For ease of analysis and to allow us to make comparisons with the three drinking patterns we measured i.e. low-risk, hazardous, and harmful drinking, we collapsed the six statements into three groups. We combined the categories '*I am a light drinker*' and '*I am a moderate drinker*'; the

categories '*I am a light drinker and sometimes I binge drink*' and '*I am a moderate drinker and sometimes I binge drink*'; and the categories '*I am a heavy drinker*' and '*I am a heavy drinker and sometimes I binge drink*'. We then compared respondents' self-perception of their own drinking against their drinking patterns as measured elsewhere in the questionnaire through the RSOD and DSM-IV questions (Box 2).

Awareness of hazardous and harmful drinking

For this part of the analysis we only included those respondents who were classified as hazardous/RSOD or harmful/dependant drinkers (n=2,420). Respondents were considered to be unaware of their own hazardous and harmful drinking if they incorrectly underestimated their drinking pattern i.e. those regular RSOD drinkers who classified themselves as light or moderate drinkers who do not binge drink and dependent drinkers who classified themselves as light or moderate drinkers who may or may not sometimes binge drink. Respondents were considered to be aware of their own hazardous or harmful drinking pattern if they described themselves as sometimes binge drinking or as a heavy drinker.

Statistical analysis

The distribution of drinking pattern was analysed by socio-demographic and addictive behaviour variables that are associated with alcohol. The socio-demographic variables analysed were age, sex, marital status, education, employment, region, dependent children; and the addictive behaviour variables analysed were smoking status (defined as being a current smoker), last year gambling (excluding lottery), and last year illicit drug use. This was analysed by cross-tabulation and statistical significance was assessed by the Pearson χ^2 test.

Cross-tabulation was used to compare the drinking pattern of respondents as measured using the RSOD and DSM-IV questions with their self-perceived drinking pattern.

Univariate logistic regression analyses were performed to determine factors associated with self-awareness of drinking pattern. Those variables which were identified as being significant or borderline significant (P<0.1) were then entered into a multivariable logistic regression model which was used to estimate adjusted odds ratios of being self-aware of hazardous or harmful drinking. This model was adjusted for gender, age, marital status, education, employment, illicit drug use, and gambling. The ability of variables identified in multivariable analysis to separate cases from non-cases was evaluated using the *c* statistic. For all analyses, a P value of less than 0.05 was considered to indicate statistical significance. Data were analysed using Stata Version 15.1 (Stata Corporation, College Station, TX, USA). Results are displayed using weighted data.

Results

Drinking patterns of respondents

Of the 7,005 survey respondents, 5,397 (77.0%, 95% CI: 75.7–78.3) had consumed alcohol in the last year; among current, or last year drinkers, a drinking pattern could be assigned to 5,144. Just over half (51.6%, 95% CI: 49.9–53.2) of drinkers were low-risk drinkers, 38% (95% CI: 36.4–39.6) engaged in regular RSOD, and 10.5% (95% CI: 9.4–11.6) were dependent drinkers. Table 1 presents the characteristics of drinkers by drinking pattern. Men accounted for 51.7% of drinkers, 56.3% of drinkers were employed and 48.8% had completed third level education. Low-risk drinkers were predominantly female, aged over 35 years and married. The characteristics of regular RSOD and dependent drinkers were similar; they were more

likely to be male, young, and single. Low-risk drinkers were most likely to have dependent children (42.6%). The likelihood of engaging in other addictive behaviours increased as hazardous/harmful drinking pattern increased. Smoking was observed in 18.5% of low-risk drinkers, compared to 31.1% of RSOD drinkers and 49.6% of dependent drinkers. Illicit drug use was observed in 2.8% of low-risk drinkers, 11.6% of RSOD drinkers and 33.9% of dependent drinkers, while the respective figures for gambling were 26.4%, 41.4% and 56.6%. The three drinking pattern categories differed with statistical significance for all variables with the exception of education.

Self-perception of own drinking and comparison with own drinking pattern

Information on drinking pattern and self-defined drinking category was available for 5,053 respondents. The majority of drinkers (70.9%) classified themselves as light or moderate drinkers who do not binge drink, 26.7% categorised themselves as light or moderate drinkers who sometimes binge drink, and 2.4% classified themselves as heavy drinkers (Table 2). Most low-risk drinkers (83.8%) described themselves as light or moderate drinkers. Almost two-thirds of regular RSOD drinkers and one-third (33.8%) of dependent drinkers described themselves as light or moderate drinkers. Just 35.1% of regular RSOD drinkers stated that they sometimes engaged in binge drinking and just 16% of dependent drinkers described themselves as a heavy drinker. A similar trend was observed among males and females. However, dependent female drinkers were less likely than males to describe themselves as a heavy drinker (11.4% vs. 18.7%). There were 426 (16.2%) low-risk drinkers and 29 (1.5%) regular RSOD drinkers who over-estimated their drinking pattern.

Awareness of own drinking among hazardous/harmful drinkers

Of those who had a hazardous or harmful pattern of drinking (n=2,420), 67.9% were unaware of this and misclassified themselves as being either a light or moderate drinker. Self-awareness of hazardous or harmful drinking pattern by socio-economic demographics and other addictive behaviours is presented in Table 3. In unadjusted analyses, respondents who were younger, who had completed secondary or third level education, and those who had engaged in illicit drug use and gambling in the previous year were significantly more likely to be aware that their drinking pattern was hazardous or harmful. Survey participants who were older, married and who were engaged in home duties or retired were significantly less likely to be aware that their drinking pattern was hazardous or harmful.

An adjusted logistic regression model identified that respondents aged 65 years and over were 0.3 times (95% CI: 0.14–0.65) as likely to be aware of their hazardous or harmful drinking pattern compared to those aged 15–24 years (Table 4). Higher education was also associated with self-awareness of hazardous or harmful drinking in multivariable analysis, with those who had completed third level education being 1.8 times (95% CI: 1.30–4.60) more likely to be aware compared to those who had completed primary education only. Participants who were aware of their hazardous or harmful drinking pattern were also more likely to engage in illicit drug use (OR = 1.45, 95% CI: 1.04–2.01) or to gamble (OR = 1.60, 95% CI: 1.27–2.01). The *c* statistic for a model which included these variables was 0.65 (95% CI: 0.63–0.68).

Patient and public involvement

No patient involved.

Discussion

Main findings of the study

The results of this nationally representative study of 7,005 respondents suggest that patterns of alcohol use in Ireland are problematic. Almost half of all drinkers either engage in frequent RSOD (38%) or score positive for alcohol dependence (10.5%). In addition to hazardous and harmful drinking patterns being commonplace in Ireland, this study finds that a majority of those who engage in such patterns of drinking are unaware of this. Low-risk drinkers were mostly aware of their own pattern of drinking, although 16.2% overestimated their drinking pattern. In comparison, awareness of drinking pattern was low for regular RSOD drinkers and for dependent drinkers. One-third (33.8%) of drinkers with a positive DSM-IV score self-categorised themselves as being either a light or moderate drinker and a further 50.3% described themselves as a light or moderate drinker who sometimes binge drinks. Given that alcohol dependence is a maladaptive pattern of alcohol consumption, manifested by symptoms leading to clinically significant impairment[15], it is particularly concerning that so many Irish people with alcohol dependence believe themselves to be light or moderate drinkers. Our adjusted regression analysis found that the factors independently associated with self-awareness of hazardous or harmful drinking pattern were having a higher educational level and engaging in risk taking behaviours, such as illicit drug use and gambling, while those aged 65 and over were significantly less likely to be aware of their hazardous or harmful drinking pattern. Nevertheless, the *c* statistic demonstrated that the ability of our model to separate cases from non-cases was poor. This indicates that there are likely to be other factors which we have not identified that are associated with awareness of drinking pattern in this population. It is possible that factors not included in this survey such as personality traits may be associated with awareness of drinking pattern and further research is required to identify these factors.

Strengths and limitations

To the best of our knowledge this is the first study to attempt to identify factors associated with the public's self-perception of their own drinking using a general population survey. A further strength is that the survey had a large sample size of 7,005, and respondents were selected using a random probability sample that was representative of the Irish population; thus our findings are generalisable to the whole population. We also used valid and reliable measures of hazardous and harmful alcohol consumption, namely the frequency of RSOD and the DSM-IV questionnaire.

However, this study has a number of limitations which need to be considered when interpreting the findings. While our results are nationally representative, response bias may also be considered a limitation; general population surveys such as this often fail to recruit the heaviest drinkers, as they may be difficult to contact and if contacted may be less likely to agree to participate.[16] Only a limited number of alcohol questions were included in this survey and they used a 12-month reference period, which may lead to reduced recall for respondents. This survey included the AUDIT-C, but not the full AUDIT. As so many drinkers (73% of men and 41% of women) met the criteria for hazardous drinking using the AUDIT-C, we felt that using measures of RSOD and dependence to denote hazardous and harmful drinking was more appropriate. Self-reporting biases are common to alcohol use surveys and lead to underestimation of alcohol consumption. The usual range of coverage from surveys is in the region of 40–60%.[17, 18] In a 2013 Irish population survey, self-reported alcohol consumption based on 'typical drink questions' accounted for just 39% of per capita sales, even though the concept of a standard drink was explained in detail to each respondent and

visual aids were provided.[6] Finally, there were discrepancies between the definitions used to define drinking patterns and the categories that respondents were asked to select from to self-assess their own drinking. However, it was felt that the alcohol terms typically used in clinical and research settings would not be as easily understood by the general public, and this was corroborated by the cognitive testing of the questionnaire that was undertaken prior to the survey.

Comparison with previous work

In relation to drinking patterns, the results of this study suggest that Ireland has a high level of RSOD when compared to other countries[4]. The prevalence of alcohol dependence in this study was also high when compared to a study of alcohol dependence in European countries, although it should be noted that a number of different instruments were used to measure dependence in the European report.[19]

The available evidence suggests that knowledge on standard drinks and drinking guidelines both in Ireland and internationally is limited, which may help explain why so few respondents correctly identified their pattern of drinking. Our findings regarding awareness of hazardous and harmful drinking are similar to a recent study in Australia, which reported that 68% of Australian drinkers who consume 11 or more standard drinks on a 'typical occasion' consider themselves a 'responsible drinker'.[20] A Swedish study reported low levels of knowledge of standard drink and hazardous drinking concepts among hazardous drinkers.[21] A review of the literature on standard drinks for the European Joint Action on Alcohol found little understanding of what the term 'standard drink' actually means and that drinkers are not able to define standard drinks accurately.[22] A 2012 Irish survey demonstrated that while 58%

had heard of the term 'standard drink', just 39% knew how many standard drinks are in a pint of lager and 33% knew how many standard drinks are in a single measure of spirits, which are the typical serving sizes of lager and spirits in Ireland.[23] In the UK, knowledge of the previous drinking guidelines was poor, in spite of them having been in place for 20 years. In 2012, only about one-quarter of people were able to provide a correct estimate of how many units it was recommended their gender should not exceed in a day, which corresponded to a lower level of awareness than in 2009. This suggests that previous efforts to raise awareness of recommended drinking limits have not had lasting effect.[24] In Australia 53.5% correctly identified the guideline threshold for women and 20.3% did so for men.[25]

Knowledge on drinking guidelines in Ireland is also poor. In 2012, just 10% of men and 10% of women knew the gender-specific low-risk limits for alcohol consumption.[23] Ireland's guidelines were last reviewed in 2009.[26] The current guidelines recommend that men consume no more than 17 standard drinks and women no more than 11 standard drinks spread over the course of a week, with at least two alcohol free days. No guidance is given in relation to daily low-risk limits. These results suggest that further work on educating the Irish public on low-risk drinking limits is required. Given the high prevalence of frequent RSOD in Ireland it may also be appropriate to introduce low-risk daily limits. Drinkers in Ireland tend to consume alcohol relatively infrequently but, on the occasions that they do, they are likely to engage in RSOD. In order for individuals to monitor and be aware of their alcohol consumption, knowledge on the standard drink concept and low-risk drinking guidelines is required. It is unrealistic to expect people to stay within low-risk limits and to be able to accurately assess their own hazardous or harmful drinking in the absence of knowledge on what actually constitutes hazardous or harmful drinking.

Policy implications

Public health messaging can be utilised to provide health guidance regarding alcohol use to the general public. A systematic review on the effectiveness of mass media public health campaigns to reduce alcohol consumption and related harms found evidence that such campaigns can be recalled by individuals and can achieve improvements in knowledge about alcohol. There was no evidence that campaigns led to decreased alcohol consumption but the authors concluded that mass media can yield sustained knowledge, which may lay the groundwork for reductions in consumption that are achieved using other public health measures.[27] In Denmark, a repeated annual campaign from 1990 to 2000 increased awareness of low-risk drinking guidelines in all subsets of the population throughout the period.[28] Hazardous drinkers were more knowledgeable about the guidelines than low-risk drinkers, which shows that this important target group can be reached. There had been limited public health messaging in Ireland on low-risk drinking prior to 2017, when an alcohol campaign 'Ask About Alcohol' was commenced to provide clear and authoritative information on alcohol to the public across a number of media platforms. The website for this campaign is the first one dedicated to dealing with alcohol to be created by a State body in Ireland. It provides advice on low-risk drinking limits and contains a drinks calculator so the public can understand exactly how much they are drinking and whether it is within low-risk limits.

This study demonstrates that further initiatives to reduce overall consumption and hazardous and harmful drinking patterns and raise awareness around drinking patterns are required. Based on the existing systematic review evidence on mass media campaigns,[27] simply having a public messaging campaign around hazardous and harmful drinking is insufficient to reduce

alcohol consumption and problematic patterns of drinking in an alcogenic culture such as Ireland, where pro-alcohol social norms and alcohol marketing and sponsorship are pervasive. Older people and those with lower educational attainment were less likely to be aware of their hazardous or harmful drinking and efforts should be made to target this group in relation to raising awareness around alcohol use. Our results also suggest that there is a cohort of younger, well-educated drinkers in Ireland who also engage in other potentially risky behaviours and that these subjects are already aware of their hazardous or harmful drinking. Consequently, it is unlikely that public health messaging alone will be sufficient to result in behaviour change for this group in relation to their alcohol use. In 2018, following a protracted process, the Public Health (Alcohol) Act was signed into law. This is the first time that Ireland's harmful use of alcohol will be addressed coherently in public health legislation. The main provisions of the Act include the introduction of a minimum unit price for alcohol, restrictions on the advertising and sponsorship of alcohol products, the structural separation of alcohol from other non-alcohol products in small shops, convenience stores and supermarkets, and labelling of all alcohol products to provide consumers with information on the number of grams of alcohol per container, calorific content, and health warnings. These measures will be enacted over the coming years with the aim of reducing alcohol consumption in Ireland. However, it is important that these initiatives are accompanied by public health messaging. If a comprehensive and sustained public health messaging campaign is implemented alongside the provisions in the Public Health Alcohol Act, the likelihood of both raising awareness and achieving meaningful reductions in alcohol consumption and problematic drinking patterns will be increased. It is also imperative that evaluations on the effectiveness of the legislative measures and the public messaging campaign are undertaken regularly to assess their impacts.

Conclusions

The results of this study indicate that a large proportion of Irish drinkers are not aware that they are consuming alcohol in a way that is potentially damaging to their health. It is likely that sustained public health messaging alongside evidence-based policy measures around pricing, availability, and marketing are required to bring about behaviour change among the Irish drinking population.

Table 1. Sociodemographic and addictive behaviour characteristics of drinkers by drinking pattern.

Weighted count=5144	All drinkers	Low-risk drinkers N (%)	Regular RSOD drinker N (%)	Dependent drinkers N (%)	P value
	5144 (100)	2652 (51.6)	1953 (38.0)	539 (10.5)	
Gender					
Male	2659 (51.7)	993 (37.5)	1327 (68.0)	339 (62.8)	<0.001
Female	2485 (48.3)	1659 (62.6)	626 (32.1)	200 (37.2)	
Age group					
15–24	831 (16.2)	290 (11.0)	344 (17.7)	197 (36.5)	<0.001
25–34	1140 (22.2)	439 (16.6)	515 (26.4)	186 (34.5)	
35–64	2576 (50.2)	1503 (56.9)	921 (47.3)	152 (28.1)	
65+	582 (11.4)	411 (15.5)	167 (8.6)	5 (0.9)	
Marital status					
Single/never married	1652 (32.2)	583 (22.0)	739 (37.9)	330 (61.8)	<0.001
Married/cohabiting	3097 (60.3)	1830 (69.1)	1097 (56.2)	170 (31.8)	
Divorced/separated/ widowed	386 (7.5)	235 (8.9)	116 (5.9)	35 (6.5)	
Education					
Primary/none	1099 (21.4)	537 (20.3)	453 (23.3)	109 (20.3)	0.0562
Completed secondary	1531 (29.8)	760 (28.7)	608 (31.2)	163 (30.4)	
Completed third level	2502 (48.8)	1351 (51.0)	886 (45.5)	265 (49.4)	
Employment					
Employed	2896 (56.3)	1410 (53.2)	1205 (61.7)	280 (52.0)	<0.001
Unemployed	500 (9.7)	203 (7.7)	219 (11.2)	78 (14.4)	
Student	534 (10.4)	204 (7.7)	203 (10.4)	127 (23.5)	
Home duties	533 (10.4)	407 (15.4)	113 (5.8)	13 (2.4)	
Retired	521 (10.1)	353 (13.3)	163 (8.3)	6 (1.1)	
Other	161 (3.1)	75 (2.8)	51 (2.6)	35 (6.6)	
Region					
Dublin	1503 (29.2)	724 (27.3)	569 (29.1)	210 (38.9)	<0.001
Outside Dublin	3642 (70.8)	1928 (72.7)	1384 (70.9)	329 (61.1)	
Dependent children					
Yes	1977 (38.6)	1124 (42.6)	725 (37.2)	128 (24.0)	<0.001

Smoking					
Yes	1365 (26.5)	490 (18.5)	607 (31.1)	268 (49.6)	<0.001
Illicit drug use					
Yes	483 (9.4)	75 (2.8)	226 (11.6)	182 (33.9)	<0.001
Gambling					
Yes	1813 (35.3)	699 (26.4)	809 (41.4)	305 (56.6)	<0.001

Numbers may not add up to the column totals because of missing data

Table 2. Self-perceived drinking category by drinking pattern.

Weighted count=5,053	**All drinkers** (n=5053)	**Low-risk drinkers** (n=2634)	**Regular RSOD drinkers** (n=1890)	**Dependent drinkers** (n=529)
All drinkers				
Light/moderate	3584 (70.9)	2208 (83.8)	1198 (63.4)	179 (33.8)
Light/moderate and sometimes binge	1348 (26.7)	419 (15.9)	663 (35.1)	266 (50.3)
Heavy drinker	121 (2.4)	7 (0.3)	29 (1.5)	85 (16.0)
Male drinkers				
Light/moderate	1726 (66.4)	812 (82.2)	802 (62.6)	111 (33.5)
Light/moderate and sometimes binge	783 (30.1)	172 (17.5)	453 (35.4)	159 (47.7)
Heavy drinker	91 (3.5)	3 (0.3)	26 (2.0)	62 (18.7)
Female drinkers				
Light/moderate	1859 (75.8)	1395 (84.8)	395 (64.9)	68(34.2)
Light/moderate and sometimes binge	565(23.0)	246 (15.0)	210 (34.6)	108 (54.4)
Heavy drinker	30 (1.2)	4 (0.2)	3 (0.5)	23 (11.4)

Table 3. Unadjusted odds ratios for factors associated with self-awareness of hazardous or harmful drinking.

Weighted count=2420	**n**	**Aware of hazardous/ harmful drinking (n=777)**	**Unaware of hazardous/ harmful drinking (n=1643)**	**OR**	**95% CI**	**P value**
Gender						
Female	808	236 (30.4)	572 (34.8)	1	Ref	
Male	1612	541 (69.6)	1071 (65.2)	1.22	0.97–1.53	0.084
Age group						
15–24	529	180 (23.1)	349 (21.3)	1	Ref	
25–34	683	282 (36.2)	401 (24.5)	1.36	0.98–1.89	0.065
35–64	1041	294 (37.9)	747 (45.6)	0.77	0.57–1.02	0.069

65+	162	22 (2.8)	140 (8.6)	**0.30**	**0.19–0.48**	**<0.001**
Marital status						
Single/never married	1036	364 (47.0)	672 (41.0)	1	Ref	
Married/cohabiting	1233	367(47.4)	866 (52.8)	**0.78**	**0.62–0.98**	**0.037**
Divorced/separated/ widowed	145	44 (5.6)	101 (6.2)	0.79	0.54–1.16	0.230
Education						
Primary/none	533	119 (15.3)	414 (25.3)	1	Ref	
Completed secondary	752	231 (29.7)	521 (31.9)	**1.54**	**1.11–2.14**	**0.009**
Completed third level	1128	427 (55.0)	701 (42.9)	**2.12**	**1.58–2.85**	**<0.001**
Employment						
Employed	1448	503 (64.8)	945 (57.5)	1	Ref	
Unemployed	352	120 (15.4)	232 (14.1)	0.97	0.72–1.31	0.842
Student	324	97 (12.5)	228 (13.9)	0.80	0.55–1.16	0.233
Home duties	120	25 (3.2)	95 (5.8)	**0.49**	**0.30–0.80**	**0.004**
Retired	163	29 (3.7)	134 (8.2)	**0.40**	**0.27–0.59**	**<0.001**
Other	13	4 (0.5)	9 (0.6)	0.73	0.22–2.42	0.602
Dependent children						
No	1582	518 (66.7)	1065 (65.2)	1	Ref	
Yes	827	258 (33.3)	569 (34.8)	0.93	0.74–1.17	0.545
Region						
Outside Dublin	1652	528 (68.0)	1123 (68.4)	1	Ref	
Dublin	768	249 (32.0)	519 (31.6)	1.02	0.79–1.31	0.888
Illicit drug use						
No	2029	608 (78.3)	1420 (86.5)	1	Ref	
Yes	391	169 (21.7)	222 (13.5)	**1.78**	**1.31–2.40**	**<0.001**
Smoking						
No	1584	493 (63.4)	1091 (66.5)	1	Ref	
Yes	836	284 (36.6)	551 (33.6)	1.14	0.91-1.44	0.254
Gambling						
No	1333	357 (45.9)	976 (59.4)	1	Ref	
Yes	1087	420 (54.1)	667 (40.6)	**1.72**	**1.38–2.15**	**<0.001**

Numbers may not add up to the column totals because of missing data
Table results shown in bold are significant (P < 0.05).

Table 4. Adjusted odds ratios for factors associated with self-awareness of hazardous or harmful drinking.

Variables	OR	95% CI	P value	Wald score
Gender				
Female	1	Ref		1.76
Male	1.19	0.92–1.54	0.185	
Age				
15–24	1	Ref		17.26
25–34	1.07	0.71–1.62	0.748	
35–64	0.66	0.43–1.01	0.055	
65+	**0.30**	**0.14–0.65**	**0.002**	
Marital status				
Single/never married	1	Ref		3.22

Married	0.98	0.73–1.32	0.912	
Divorced/separated/ widowed	1.40	0.90–2.18	0.135	
Education				
Primary/none	1	Ref		13.22
Completed secondary	1.36	0.96–1.93	0.079	
Third level	**1.80**	**1.30–2.49**	**<0.001**	
Employment				
Employed	1	Ref		3.95
Unemployed	1.05	0.75–1.49	0.770	
Student	0.70	0.44–1.13	0.142	
Home duties	0.77	0.45–1.33	0.354	
Retired	1.06	0.57–1.95	0.857	
Other	0.52	0.13–2.16	0.371	
Illicit drug use				
No	1	Ref		4.96
Yes	**1.45**	**1.04–2.01**	**0.026**	
Gambling				
No	1	Ref		15.75
Yes	**1.60**	**1.27–2.01**	**<0.001**	

*ORs are adjusted for all other variables in the table.
Table results shown in bold are significant (P < 0.05).

Box 1: Drinking pattern assigned to drinkers

Low-risk – drinkers who did not meet the criteria for alcohol dependence and who had not engaged in monthly RSOD in the past year

Hazardous – drinkers who had engaged in RSOD at least monthly, but did not meet the criteria for alcohol dependence in the past year

Harmful – drinkers who met the DSM-IV criteria for dependence in the past year

Box 2: Self-perception of own drinking

Light/moderate – those who selected one of these statements: '*I am a light drinker*' or '*I am a moderate drinker*'

Light/moderate and sometimes binge drink – those who selected one of these statements: '*I am a light drinker and sometimes I binge drink*' or '*I am a moderate drinker and sometimes I binge drink*'

Heavy – those who selected one of these statements: '*I am a heavy drinker*' or *'I am a heavy drinker and sometimes I binge drink'*

Declarations

Ethics approval and consent to participate: Ethical approval for the 2014/15 Drug Prevalence Survey was granted by the Royal College of Physicians Ireland (Ref: RECSAF 21).

Consent for publication: Not applicable

Availability of data and material: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: None

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Authors' contributions: DM designed the study, analysed the data, and drafted the manuscript. SM provided statistical support and helped interpret the data. COD undertook a review of the literature and provided assistance with data analysis. JL was involved in the design and conception of the study. BG supervised the study. All authors reviewed and helped to revise successive drafts and approved the final version of the manuscript.

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	#3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	#4	Present key elements of study design early in the paper	5-6
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	5
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers.	6-8

		Give diagnostic criteria, if applicable	
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	6-8
Bias	#9	Describe any efforts to address potential sources of bias	n/a
Study size	#10	Explain how the study size was arrived at	5
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	9
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	9
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	9
Statistical methods	#12c	Explain how missing data were addressed	9
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	9
Statistical methods	#12e	Describe any sensitivity analyses	n/a
Results			
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	10
Participants	#13b	Give reasons for non-participation at each stage	10
Participants	#13c	Consider use of a flow diagram	n/a
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	Table 1
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	10-12
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-12
Main results	#16b	Report category boundaries when continuous variables were categorized	10-12

Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	10-12
Discussion			
Key results	#18	Summarise key results with reference to study objectives	12
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	13-14
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	14
Generalisability	#21	Discuss the generalisability (external validity) of the study results	13, 15
Other Information			
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	22