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

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2019-034520
Article Type:	Original research
Date Submitted by the Author:	03-Oct-2019
Complete List of Authors:	Mongan, Deirdre; Health Research Board, Millar, Sean; Health Research Board; University College Cork, School of Public Health O'Dwyer, Claire; Health Research Board, Evidence Centre Long, Jean; Health Research Board Galvin, Brian; Health Research Board
Keywords:	alcohol, consumption, hazardous, drinking patterns, self-awareness

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2
3 1 **Title page**

4
5 2 **Title: Drinking in denial: Irish drinkers' awareness of their alcohol use**

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24
25 12 **Word count:**

26
27 13 3,868

28
29 14 **Keywords:**

30
31 15 Alcohol; Consumption; Hazardous; Drinking patterns; Self-Awareness

32
33 16

34
35 17 **Running Title:**

36
37 18 Drinking in denial: Irish drinkers' self-perception of their alcohol use

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3 29 **Abstract**
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5 30 **Objectives:** Ireland has high per capita alcohol consumption and high levels of problematic
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7
8 31 drinking patterns. It is not clear if Irish people are aware of the extent of their problematic
9
10 32 drinking. The aim was to determine awareness of drinking patterns in an Irish population
11
12
13 33 and to identify characteristics associated with self-awareness of hazardous/harmful
14
15 34 drinking.
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18 35
19
20 36 **Setting:** 2014/2015 Irish Drug Prevalence Survey which recruited a stratified clustered
21
22
23 37 sample of 7,005 individuals living in the Republic of Ireland.
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25

26 38
27
28 39 **Participants:** Survey respondents who had not consumed alcohol in the last year were
29
30 40 excluded. 5,397 (77%) of the 7,005 survey respondents were included in the analyses.
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35 42 **Primary and secondary outcome measures:** Hazardous drinking as defined by monthly risky
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37 43 single occasion drinking (RSOD); harmful drinking defined by meeting DSM-IV criteria for
38
39 44 alcohol dependence; self-reported awareness of engaging in a hazardous/harmful drinking
40
41 45 pattern
42
43
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45 46
46
47 47 **Results:** Of those reporting a hazardous/harmful pattern of drinking, 67% were unaware of
48
49 48 this and misclassified themselves as a light or moderate drinker who did not engage in
50
51 49 RSOD. An adjusted logistic regression model identified that respondents who had completed
52
53 50 third level education were more likely to be aware of their drinking pattern (OR = 1.80, 95%
54
55 51 CI: 1.30–2.49), as were drinkers who engaged in risk taking behaviours such as illicit drug
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3 52 use and gambling. Older drinkers (65+) were less likely to be aware of their drinking pattern
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6 53 (OR = 0.30, 95% CI: 0.14–0.65).
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10 55 **Conclusions:** Our results confirm that patterns of alcohol use in Ireland are problematic.
11
12
13 56 Older respondents and those with lower educational attainment are less likely to be aware
14
15
16 57 of their hazardous or harmful drinking pattern. There is a population of younger, more-
17
18 58 educated drinkers who engage in risk-taking behaviours who are aware of their harmful
19
20 59 drinking. Initiatives to reduce overall alcohol consumption and raise awareness around
21
22
23 60 drinking patterns are required.
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26 61

27 62 **Article Summary**

29 63 **Strengths and limitations of this study:**

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32
33 64 • To the best of our knowledge this is the first study to attempt to identify factors
34
35
36 65 associated with the public's self-perception of their own drinking with their actual
37
38
39 66 drinking pattern using a general population survey
40
41
42 67 • The survey had a large sample size of 7,005, and respondents were selected using a
43
44 68 random probability sample that was representative of the Irish population, allowing
45
46 69 our results to be generalised to the Irish population
47
48
49 70 • While our results are nationally representative, response bias may also be
50
51 71 considered a limitation; self-reporting biases are common to alcohol use surveys and
52
53 72 lead to underestimation of alcohol consumption
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78 Introduction

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

93

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

1
2
3 99 overall volume of alcohol consumed.⁹ The World Health Organization (WHO) reported in
4
5
6 100 2014 that 37% of all Irish people aged 15 years and over had engaged in heavy episodic
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8 101 drinking or RSOD in the past 30 days, placing Ireland in third place among the 194 countries
9
10
11 102 analysed.¹ Three-quarters of all alcohol consumed in Ireland is done so as part of a RSOD
12
13 103 session.⁷

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18 105 While it is accepted that patterns of alcohol consumption in Ireland are a cause for concern,
19
20 106 it is not clear if Irish people are actually aware of the extent of their hazardous or harmful
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22
23 107 pattern of drinking. The aim of this study was to determine awareness of drinking patterns
24
25 108 in an Irish population using a representative random sample and to identify characteristics
26
27 109 associated with self-awareness of hazardous or harmful drinking.

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31 32 111 **Methods**

33 34 112 ***Sampling and study population***

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36
37 113 We analysed data from Ireland's 2014/15 Drug Prevalence Survey. This national survey
38
39
40 114 recruited a stratified clustered sample of 7,005 individuals aged 15 years and over, living in
41
42 115 private households in Ireland. The sampling frame used was the GeoDirectory, which is a list
43
44
45 116 of all addresses in the Republic of Ireland, and distinguishes between residential and
46
47 117 commercial establishments. A three-stage process was used to construct the sample for this
48
49
50 118 survey. The first stage involved stratifying the population into 10 former health board
51
52 119 regions in Ireland. In the second stage of stratification, 421 electoral divisions were selected
53
54 120 as the primary sampling units across the 10 former health board regions. Before selection,
55
56
57 121 the primary sampling units were ranked by the following socio-demographic indicators:
58
59 122 population density, male unemployment and social class, to ensure that a representative

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2
3 123 cross-section of areas were included. Finally, in each primary sampling unit, 31 addresses
4
5
6 124 were chosen randomly, and at each address, one person was selected to participate in the
7
8 125 survey, using the 'last birthday' rule. The achieved sample was weighted by gender, age and
9
10 126 former health board region to maximise its representativeness of the general population. A
11
12
13 127 more comprehensive description of the survey's methodology has been detailed
14
15 128 elsewhere.¹⁰ The survey involved a face-to-face interview in the participants' home and a
16
17
18 129 self-completion questionnaire. Respondents also self-completed questions in relation to
19
20 130 alcohol dependence and their perception of their own drinking pattern. The home
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22
23 131 interviews were conducted by trained interviewers using Computer Assisted Personal
24
25 132 Interviewing (CAPI). Interviews were completed between August 2014 and August 2015, and
26
27
28 133 achieved a 60% response rate. The survey was granted ethical approval by the Royal
29
30 134 College of Physicians in Ireland and all participants gave written informed consent.

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34 35 136 ***Patient and public involvement***

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37 137 Patients or the public were not involved in the design, or conduct, or reporting, or
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39
40 138 dissemination of the research study.

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44 45 140 ***Definitions of drinking patterns***

46
47 141 Current drinkers were defined as those who had consumed alcohol at least once in the last
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49
50 142 12 months. Non-drinkers, categorised as those who had not consumed alcohol in the past
51
52
53 143 year (n=1,608), were excluded from this study.

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55 144

56 57 145 ***Hazardous drinking – Regular RSOD in the past year***

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3 146 There are no internationally agreed definitions on how much alcohol constitutes a RSOD
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5
6 147 episode or on what is regular RSOD. We defined RSOD as consuming 60g of pure alcohol on
7
8 148 a single drinking occasion. Respondents were asked how often they had consumed the
9
10
11 149 equivalent of six standard drinks on a single drinking occasion in the past year. In Ireland, a
12
13 150 standard drink contains 10g of pure alcohol. Frequency of RSOD was measured as follows:
14
15 151 daily, 5–6 times a week, 4 times a week, 3 times a week, 2 times a week, once a week, 2–3
16
17
18 152 times a month, once a month, 6–11 times a year, 2–5 times a year and once a year. The
19
20 153 concept of a standard drink and what constitutes 60g of alcohol was explained in detail to
21
22 154 each respondent and visual aids were provided depicting 60g of alcohol according to
23
24
25 155 beverage type. We defined hazardous drinking as engaging in RSOD at least monthly in the
26
27 156 previous 12 months, similar to the WHO definition.¹
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31 32 158 *Harmful drinking – alcohol dependence*

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35 159 Alcohol dependence was defined according to DSM-IV criteria, and was measured via self-
36
37 160 completed questionnaire using the ten items that denote alcohol dependence from the
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40 161 Composite International Diagnostic Interview, an instrument that is used in many general
41
42 162 population studies.¹¹ Alcohol dependence was established from a positive response in three
43
44
45 163 or more of the seven domains on the DSM-IV diagnostic criteria in the twelve months before
46
47 164 the interview.¹² Drinkers who met the criteria for both regular RSOD and alcohol
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49
50 165 dependence were assigned to the alcohol dependence drinking type. Respondents who did
51
52 166 not have complete data on RSOD and a DSM-IV score (n=236) were excluded from the
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55 167 analysis.
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58 59 169 *Low-risk drinking*

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3 170 For this study, low-risk drinking was defined as drinking that did not fit our criteria of
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6 171 hazardous or harmful drinking i.e. those drinkers who were not alcohol dependent and who
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8 172 also did not engage in regular RSOD.
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13 174 *Self-perception of own drinking*

15 175 Drinkers were asked to describe their own drinking by selecting one of the following six
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18 176 statements: '*I am a heavy drinker*'; '*I am a heavy drinker and sometimes I binge drink*'; '*I am*
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20 177 '*a moderate drinker*'; '*I am a moderate drinker and sometimes I binge drink*'; '*I am a light*
21
22 178 '*drinker*'; or '*I am a light drinker and sometimes I binge drink*'. This question was cognitively
23
24
25 179 tested prior to the survey and the wording used reflects the feedback received from the
26
27
28 180 participants following the cognitive testing exercise on their understanding of the terms
29
30 181 used. This question was answered by respondents via self-completed questionnaire. No
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32 182 descriptions of the terms 'light', 'moderate', 'heavy' or 'binge' were provided to
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34
35 183 respondents. The terms 'light' and 'moderate' were used in this question instead of 'low-
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37 184 risk' as they are terms generally used in Ireland to denote low-risk drinking. Similarly, the
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40 185 term 'binge' was used instead of RSOD. For this analysis we combined the categories '*I am a*
41
42 186 '*light drinker*' and '*I am a moderate drinker*'; the categories '*I am a light drinker and*
43
44 187 '*sometimes I binge drink*' and '*I am a moderate drinker and sometimes I binge drink*'; and the
45
46
47 188 categories '*I am a heavy drinker*' and '*I am a heavy drinker and sometimes I binge drink*'. We
48
49
50 189 then compared respondents' self-perception of their own drinking against their drinking
51
52 190 patterns as measured elsewhere in the questionnaire through the RSOD and DSM-IV
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54 191 questions.
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59 193 *Awareness of hazardous and harmful drinking*

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3 194 Respondents were considered to be unaware of their own hazardous and harmful drinking if
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6 195 they incorrectly underestimated their drinking pattern i.e. those regular RSOD drinkers who
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8 196 classified themselves as light or moderate drinkers who do not binge drink and dependent
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10 197 drinkers who classified themselves as light or moderate drinkers who may or may not
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13 198 sometimes binge drink. Respondents were considered to be aware of their own hazardous
14
15 199 or harmful drinking pattern if they described themselves as sometimes binge drinking or as
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17
18 200 a heavy drinker.

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21 22 23 202 ***Statistical analysis***

24
25 203 The distribution of drinking pattern was analysed by socio-demographic and addictive
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27 204 behaviour variables that are associated with alcohol. The socio-demographic variables
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29
30 205 analysed were age, sex, marital status, education, employment, region, dependent children;
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32 206 and the addictive behaviour variables analysed were smoking status (defined as being a
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34
35 207 current smoker), last year gambling (excluding lottery), and last year illicit drug use. This was
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37 208 analysed by cross-tabulation and statistical significance was assessed by the Pearson χ^2 test.
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39
40 209 Cross-tabulation was used to compare the drinking pattern of respondents as measured
41
42 210 using the RSOD and DSM-IV questions to their self-perceived drinking pattern. With
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44
45 211 consideration for missing values, only valid percentages are reported.

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49 213 Univariate logistic regression analyses were performed to determine factors associated with
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51
52 214 self-awareness of drinking pattern. Those variables which were identified as being
53
54 215 significant or borderline significant ($P < 0.1$) were then entered into a multivariable logistic
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56
57 216 regression model which was used to estimate adjusted odds ratios of being self-aware of
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59 217 hazardous or harmful drinking. The ability of variables identified in multivariable analysis to

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3 218 separate cases from non-cases was evaluated using the *c* statistic. For all analyses, a P value
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6 219 of less than 0.05 was considered to indicate statistical significance. Data were analysed
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8 220 using Stata Version 15.1 (Stata Corporation, College Station, TX, USA). Results are displayed
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10
11 221 using weighted data.

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13 22214
15 223 **Results**16
17 224 *Drinking patterns of respondents*

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20 225 Of the 7,005 survey respondents, 5,397 (77.0%, 95% CI: 75.7–78.3) had consumed alcohol in
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22
23 226 the last year; among current, or last year drinkers, a drinking pattern could be assigned to
24
25 227 5,144. Just over half (51.6%, 95% CI: 49.9–53.2) of drinkers were low-risk drinkers, 38% (95%
26
27 228 CI: 36.4–39.6) engaged in regular RSOD, and 10.5% (95% CI: 9.4–11.6) were dependent
28
29
30 229 drinkers. Table 1 presents the characteristics of drinkers by drinking pattern. Men
31
32 230 accounted for 51.7% of drinkers, 56.3% of drinkers were employed and 48.8% had
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34 231 completed third level education. Low-risk drinkers were predominantly female, aged over
35
36 232 35 years and married. The characteristics of regular RSOD and dependent drinkers were
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38
39 233 similar; they were more likely to be male, young and single. Low-risk drinkers were most
40
41 234 likely to have dependent children (42.6%). The likelihood of engaging in other addictive
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44 235 behaviours increased as hazardous/harmful drinking pattern increased. Smoking was
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46 236 observed in 18.5% of low-risk drinkers, compared to 31.1% of RSOD drinkers and 49.6% of
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48
49 237 dependent drinkers. Illicit drug use was observed in 2.8% of low-risk drinkers, 11.6% of
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51 238 RSOD drinkers and 33.9% of dependent drinkers, while the respective figures for gambling
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54 239 were 26.4%, 41.4% and 56.6%. The three drinking pattern categories differed with statistical
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56
57 240 significance for all variables with the exception of education.

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3 242 *Self-perception of own drinking and comparison with own drinking pattern*
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6 243 Information on drinking pattern and self-defined drinking category was available for 5,053
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8 244 respondents. The majority of drinkers (70.9%) classified themselves as light or moderate
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10 245 drinkers who do not binge drink, 26.7% categorised themselves as light or moderate
11
12 246 drinkers who sometimes binge drink, and 2.4% classified themselves as heavy drinkers
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14 247 (Table 2). Most low-risk drinkers (83.8%) described themselves as light or moderate
15
16 248 drinkers. Almost two-thirds of regular RSOD drinkers and one-third (33.8%) of dependent
17
18 249 drinkers described themselves as light or moderate drinkers. Just 35.1% of regular RSOD
19
20 250 drinkers stated that they sometimes engaged in binge drinking and just 16% of dependent
21
22 251 drinkers described themselves as a heavy drinker. A similar trend was observed among
23
24 252 males and females. However, dependent female drinkers were less likely than males to
25
26 253 describe themselves as a heavy drinker (11.4% vs. 18.7%). There were 426 (16.2%) low-risk
27
28 254 drinkers and 29 (1.5%) regular RSOD drinkers who over-estimated their drinking pattern.
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35 255
36 256 *Awareness of own drinking among hazardous/harmful drinkers*
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39 257 Of those who had a hazardous or harmful pattern of drinking, 67.9% were unaware of this
40
41 258 and misclassified themselves as being either a light or moderate drinker. Self-awareness of
42
43 259 hazardous or harmful drinking pattern by socio-economic demographics and other addictive
44
45 260 behaviours is presented in Table 3. In unadjusted analyses, respondents who were younger,
46
47 261 who had completed secondary or third level education, and those who had engaged in illicit
48
49 262 drug use and gambling in the previous year were significantly more likely to be aware that
50
51 263 their drinking pattern was hazardous or harmful. Survey participants who were older,
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53 264 married and who were engaged in home duties or retired were significantly less likely to be
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55 265 aware that their drinking pattern was hazardous or harmful.
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6 267 An adjusted logistic regression model identified that respondents aged 65 years and over
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8 268 were 0.3 times (95% CI: 0.14–0.65) as likely to be aware of their hazardous or harmful
9
10 269 drinking pattern compared to those aged 15–24 years (Table 4). Higher education was also
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12
13 270 associated with self-awareness of hazardous or harmful drinking in multivariable analysis,
14
15 271 with those who had completed third level education being 1.8 times (95% CI: 1.30–4.60)
16
17 272 more likely to be aware compared to those who had completed primary education only.
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20 273 Participants who were aware of their hazardous or harmful drinking pattern were also more
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23 274 likely to engage in illicit drug use (OR = 1.45, 95% CI: 1.04–2.01) or to gamble (OR = 1.60,
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25 275 95% CI: 1.27–2.01). The c statistic for a model which included these variables was 0.65 (95%
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27 276 CI: 0.63–0.68).

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278 Discussion

279 *Main findings of the study*

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

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3 290 dependence is a maladaptive pattern of alcohol consumption, manifested by symptoms
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6 291 leading to clinically significant impairment¹³, it is particularly concerning that so many Irish
7
8 292 people with alcohol dependence believe themselves to be light or moderate drinkers. Our
9
10 293 adjusted regression analysis found that factors independently associated with self-
11
12 294 awareness of hazardous or harmful drinking pattern were having a higher educational level
13
14 295 and engaging in risk taking behaviours, such as illicit drug use and gambling, while those
15
16 296 aged 65 and over were significantly less likely to be aware of their hazardous or harmful
17
18 297 drinking pattern. Nevertheless, the *c* statistic demonstrated that the ability of our model to
19
20 298 separate cases from non-cases was poor. This indicates that there are likely to be other
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22 299 factors which we have not identified that are associated with awareness of drinking pattern
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24 300 in this population and that further research is required to identify these factors.
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32 *Strengths and limitations*

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35 303 To the best of our knowledge this is the first study to attempt to identify factors associated
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37 304 with the public's self-perception of their own drinking with their actual drinking pattern
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39 305 using a general population survey. A further strength is that the survey had a large sample
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41 306 size of 7,005, and respondents were selected using a random probability sample that was
42
43 307 representative of the Irish population; thus our findings are generalisable to the whole
44
45 308 population. We also used valid and reliable measures of hazardous and harmful alcohol
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47 309 consumption, namely the frequency of RSOD and the DSM-IV questionnaire.
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54 311 However, this study has a number of limitations which need to be considered when
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56 312 interpreting the findings. While our results are nationally representative, response bias may
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58 313 also be considered a limitation; general population surveys such as this often fail to recruit
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3 314 the heaviest drinkers, as they may be difficult to contact and if contacted may be less likely
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5 315 to agree to participate.¹⁴ Self-reporting biases are common to alcohol use surveys and lead
6
7 316 to underestimation of alcohol consumption. The usual range of coverage from surveys is in
8
9
10 317 the region of 40–60%.^{15, 16} In a 2013 Irish population survey, self-reported alcohol
11
12 318 consumption based on ‘typical drink questions’ accounted for just 39% of per capita sales,
13
14 319 even though the concept of a standard drink was explained in detail to each respondent and
15
16 320 visual aids were provided.⁷ Finally, there were discrepancies between the definitions used
17
18 321 to define drinking patterns and the categories that respondents were asked to select from
19
20 322 to self-assess their own drinking. However, it was felt that the alcohol terms typically used
21
22 323 in clinical and research settings would not be as easily understood by the general public, and
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24 324 this was corroborated by the cognitive testing of the questionnaire that was undertaken
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26 325 prior to the survey.
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35 327 *Comparison with previous work*

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37 328 The available evidence suggests that knowledge on standard drinks and drinking guidelines
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39 329 both in Ireland and internationally is limited, which may help explain why so few
40
41 330 respondents correctly identified their pattern of drinking. A Swedish study reported low
42
43 331 levels of knowledge of standard drink and hazardous drinking concepts among hazardous
44
45 332 drinkers.¹⁷ A review of the literature on standard drinks for the European Joint Action on
46
47 333 Alcohol found little understanding of what the term ‘standard drink’ actually means and
48
49 334 that drinkers are not able to define standard drinks accurately.¹⁸ A 2012 Irish survey
50
51 335 demonstrated that while 58% had heard of the term ‘standard drink’, just 39% knew how
52
53 336 many standard drinks are in a pint of lager and 33% knew how many standard drinks are in a
54
55 337 single measure of spirits, which are the typical serving sizes of lager and spirits in Ireland.¹⁹
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3 338 In the UK, knowledge of the previous drinking guidelines was poor, in spite of them having
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6 339 been in place for 20 years. In 2012, only about one-quarter of people were able to provide a
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8 340 correct estimate of how many units it was recommended their gender should not exceed in
9
10 341 a day, which corresponded to a lower level of awareness than in 2009. This suggests that
11
12 342 previous efforts to raise awareness of recommended drinking limits have not had lasting
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14 343 effect.²⁰ In Australia 53.5% correctly identified the guideline threshold for women and 20.3%
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16 344 did so for men.²¹

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23 346 Knowledge on drinking guidelines in Ireland is also poor. In 2012, just 10% of men and 10%
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25 347 of women knew the gender-specific low-risk limits for alcohol consumption.¹⁹ Ireland's
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27 348 guidelines were last reviewed in 2009.²² The current guidelines recommend that men
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29 349 consume no more than 17 standard drinks and women no more than 11 standard drinks
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31 350 spread over the course of a week, with at least two alcohol free days. No guidance is given
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33 351 in relation to daily low-risk limits. These results suggest that further work on educating the
34
35 352 Irish public on low-risk drinking limits is required. Given the high prevalence of frequent
36
37 353 RSOD in Ireland it may also be appropriate to introduce low-risk daily limits. Drinkers in
38
39 354 Ireland tend to consume alcohol relatively infrequently but, on the occasions that they do,
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41 355 they are likely to engage in RSOD. In order for individuals to monitor and be aware of their
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43 356 alcohol consumption, knowledge on the standard drink concept and low-risk drinking
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45 357 guidelines is required. It is unrealistic to expect people to stay within low-risk limits and to
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47 358 be able to accurately assess their own hazardous or harmful drinking in the absence of
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49 359 knowledge on what actually constitutes hazardous or harmful drinking.
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59 361 *Policy implications*
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3 362 Public health messaging can be utilised to provide health guidance regarding alcohol use to
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6 363 the general public. A systematic review on the effectiveness of mass media public health
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8 364 campaigns to reduce alcohol consumption and related harms found evidence that such
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10 365 campaigns can be recalled by individuals and can achieve improvements in knowledge
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13 366 about alcohol. There was no evidence that campaigns led to decreased alcohol consumption
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15 367 but the authors concluded that mass media can yield sustained knowledge, which may lay
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18 368 the groundwork for reductions in consumption that are achieved using other public health
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20 369 measures.²³ In Denmark, a repeated annual campaign from 1990 to 2000 increased
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23 370 awareness of low-risk drinking guidelines in all subsets of the population throughout the
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25 371 period.²⁴ Hazardous drinkers were more knowledgeable about the guidelines than low-risk
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28 372 drinkers, which shows that this important target group can be reached. There had been
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30 373 limited public health messaging in Ireland on low-risk drinking prior to 2017, when an
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32 374 alcohol campaign 'Ask About Alcohol' was commenced to provide clear and authoritative
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35 375 information on alcohol to the public across a number of media platforms. The website for
36
37 376 this campaign is the first one dedicated to dealing with alcohol to be created by a State body
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40 377 in Ireland. It provides advice on low-risk drinking limits and contains a drinks calculator so
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42 378 the public can understand exactly how much they are drinking and whether it is within low-
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45 379 risk limits.

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49 381 This study demonstrates that further initiatives to reduce overall consumption and
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52 382 hazardous and harmful drinking patterns and raise awareness around drinking patterns are
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54 383 required. Based on the existing evidence, simply having a public messaging campaign
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57 384 around hazardous and harmful drinking is insufficient to reduce alcohol consumption and
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59 385 problematic patterns of drinking in an alcogenic culture such as Ireland, where pro-alcohol
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3 386 social norms and alcohol marketing and sponsorship are pervasive. Our results also suggest
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6 387 that there is a cohort of younger, well-educated drinkers in Ireland who also engage in other
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8 388 potentially risky behaviours and that these subjects are already aware of their hazardous or
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11 389 harmful drinking. Consequently, it is unlikely that public health messaging alone will be
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13 390 sufficient to result in behaviour change for this group in relation to their alcohol use. In
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15 391 2018, following a protracted process, the Public Health (Alcohol) Act was signed into law.
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18 392 This is the first time that Ireland's harmful use of alcohol will be addressed coherently in
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20 393 public health legislation. The main provisions of the Act include the introduction of a
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23 394 minimum unit price for alcohol, restrictions on the advertising and sponsorship of alcohol
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25 395 products, the structural separation of alcohol from other non-alcohol products in small
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28 396 shops, convenience stores and supermarkets, and labelling of all alcohol products to provide
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30 397 consumers with information on the number of grams of alcohol per container, calorific
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33 398 content, and health warnings. These measures will be enacted over the coming years with
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35 399 the aim of reducing alcohol consumption in Ireland. However, it is important that these
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38 400 initiatives are accompanied by public health messaging. If a comprehensive and sustained
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40 401 public health messaging campaign is implemented alongside the provisions in the Public
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42 402 Health Alcohol Act, the likelihood of both raising awareness and achieving meaningful
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45 403 reductions in alcohol consumption and problematic drinking patterns will be increased. It is
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47 404 also imperative that evaluations on the effectiveness of the legislative measures and the
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49 405 public messaging campaign are undertaken regularly to assess their impacts.

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53 54 407 **Conclusions**

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57 408 The results of this study indicate that a large proportion of Irish drinkers are not aware that
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59 409 they are consuming alcohol in a way that is potentially damaging to their health. It is likely
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410 that sustained public health messaging alongside evidence-based policy measures around
 411 pricing, availability, and marketing are required to bring about behaviour change among the
 412 Irish drinking population.

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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 ($P < 0.05$).

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17 418 **Declarations**

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20 419 Ethics approval and consent to participate: Ethical approval for the 2014/15 Drug

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22 420 Prevalence Survey was granted by the Royal College of Physicians Ireland.

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25 421 Consent for publication: Not applicable

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28 422 Availability of data and material: The datasets used and/or analysed during the current

29
30 423 study are available from the corresponding author on reasonable request.

31
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33 424 Competing interests: None

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35
36 425 Funding: Funding was provided by the Department of Health, Ireland

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38
39 426 Author contributions: DM conceived of the design of the current study. DM & SM

40
41 427 performed the data analysis and interpretation. DM drafted the paper and all other authors

42
43 428 provided critical revisions. All authors read and approved the final manuscript.

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45
46 429 Acknowledgements: None

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50 430 Patient and public involvement: Patients or the public were not involved in the design, or

51
52 431 conduct, or reporting, or dissemination of the research study.

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For peer review only

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	
1			
2	Data sources /	#8	For each variable of interest give sources of data and details of methods of assessment
3	measurement		(measurement). Describe comparability of assessment methods if there is more than one group.
4			Give information separately for for exposed and unexposed groups if applicable.
5			
6			
7			
8	Bias	#9	Describe any efforts to address potential sources of bias
9			n/a
10	Study size	#10	Explain how the study size was arrived at
11			5
12	Quantitative	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which
13	variables		groupings were chosen, and why
14			9
15			
16	Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding
17			9
18	Statistical methods	#12b	Describe any methods used to examine subgroups and interactions
19			9
20	Statistical methods	#12c	Explain how missing data were addressed
21			9
22	Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy
23			9
24	Statistical methods	#12e	Describe any sensitivity analyses
25			n/a
26			
27			
28	Results		
29			
30	Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible,
31			examined for eligibility, confirmed eligible, included in the study, completing follow-up, and
32			analysed. Give information separately for for exposed and unexposed groups if applicable.
33			10
34	Participants	#13b	Give reasons for non-participation at each stage
35			10
36	Participants	#13c	Consider use of a flow diagram
37			n/a
38			
39	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on
40			exposures and potential confounders. Give information separately for exposed and unexposed
41			groups if applicable.
42			10
43	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest
44			Table 1
45	Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for
46			exposed and unexposed groups if applicable.
47			10-12
48	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision
49			(eg, 95% confidence interval). Make clear which confounders were adjusted for and why they
50			were included
51			11-12
52	Main results	#16b	Report category boundaries when continuous variables were categorized
53			10-12
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1	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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4	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	10-12
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8	Discussion			
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11	Key results	#18	Summarise key results with reference to study objectives	12
12				
13	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
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17	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	14
18				
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21	Generalisability	#21	Discuss the generalisability (external validity) of the study results	13, 15
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24	Other			
25	Information			
26				
27	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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BMJ Open

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

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2019-034520.R1
Article Type:	Original research
Date Submitted by the Author:	12-Mar-2020
Complete List of Authors:	Mongan, Deirdre; Health Research Board, Millar, Sean; Health Research Board; University College Cork, School of Public Health O'Dwyer, Claire; Health Research Board, Evidence Centre Long, Jean; Health Research Board Galvin, Brian; Health Research Board
Primary Subject Heading:	Public health
Secondary Subject Heading:	Epidemiology, Health policy
Keywords:	alcohol, consumption, hazardous, drinking patterns, self-awareness

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2
3 1 **Title page**
4

5 2 **Title: Drinking in denial: a cross sectional analysis of national survey data in Ireland to**
6 3 **measure drinkers' awareness of their alcohol use**
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29 13 **Keywords:** Alcohol; Consumption; Hazardous; Drinking patterns; Self-Awareness
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32 15 **Running Title:** Drinking in denial: Irish drinkers' self-perception of their alcohol use
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36 17 **Research Ethics Approval:** Granted by the Royal College of Physicians Ireland (Ref: RECSAF
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41

42 20 **Contributorship statement:** DM designed the study, analysed the data, and drafted the
43
44 21 manuscript. SM provided statistical support and helped interpret the data. COD undertook a
45
46 22 review of the literature and provided assistance with data analysis. JL was involved in the
47
48 23 design and conception of the study. BG supervised the study. All authors reviewed and
49
50 24 helped to revise successive drafts and approved the final version of the manuscript.
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1
2
3 29 **Abstract**
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5 30 **Objectives:** Ireland has high per capita alcohol consumption and also has high levels of
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8 31 problematic drinking patterns. While it is accepted that patterns of alcohol consumption in
9
10 32 Ireland are a cause for concern, it is not clear if Irish people are actually aware of the extent
11
12 33 of their hazardous or harmful pattern of drinking. The aim of this study was to determine
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14 34 awareness of drinking pattern in an Irish population using a representative random sample
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16 35 and to identify characteristics associated with self-awareness of hazardous or harmful
17
18 36 drinking.
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25 38 **Methods:** We analysed data from Ireland's 2014/15 Drug Prevalence Survey which recruited
26
27 39 a stratified clustered sample of 7,005 individuals aged 15 years and over living in private
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29 40 households. Logistic regression analysis was used to determine characteristics associated
30
31 41 with self-awareness of hazardous or harmful drinking.
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38 43 **Results:** Almost one half of drinkers had a hazardous or harmful pattern of drinking; 38%
39
40 44 engaged in monthly risky single occasion drinking (RSOD) and 10.5% met DSM-IV for alcohol
41
42 45 dependence. Of the 2,420 respondents who had a hazardous or harmful pattern of drinking,
43
44 46 67% were unaware of this and misclassified themselves as being either a light or moderate
45
46 47 drinker who did not engage in risky single occasion drinking. An adjusted logistic regression
47
48 48 model identified that hazardous and harmful drinkers were more likely to be aware of their
49
50 49 drinking pattern if they had completed third level education (OR = 1.80, 95% CI: 1.30–2.49)
51
52 50 while older drinkers (aged 65 and over) were less likely to be aware of their drinking pattern
53
54 51 (OR = 0.30, 95% CI: 0.14–0.65). Subjects who engaged in risk taking behaviours such as illicit
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3 52 drug use and gambling were also significantly more likely to be aware of their drinking
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5
6 53 pattern.
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10 55 **Conclusions:** The results of this study suggest that patterns of alcohol use in Ireland are
11
12
13 56 problematic. Older respondents and those with lower educational attainment are less likely
14
15
16 57 to be aware of their hazardous or harmful drinking pattern. There is also a population of
17
18 58 younger, more-educated drinkers who engage in potentially risk-taking behaviours and these
19
20 59 subjects are aware of their harmful drinking pattern. Initiatives to reduce overall alcohol
21
22
23 60 consumption and raise awareness around drinking patterns are required.
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25
26 61

27 62 **Strengths and limitations of this study**

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30 63
- 31 • This was a large national survey which was representative of the Irish population.
 - 32 64 • The study employed standardised methods for the measurement of hazardous and harmful
33
34 65 alcohol consumption.
 - 35
36 66 • Although the overall response rate was good, alcohol surveys often fail to recruit the heaviest
37
38 67 drinkers, resulting in selection bias.
 - 39
40
41 68 • There were discrepancies between the definitions used to define drinking patterns and the
42
43 69 categories that respondents were asked to select from to self-assess their own drinking
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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

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3 100 much higher priority for a given individual than other behaviours that once had greater
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6 101 value'.⁵
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10 103 Alcohol use in Ireland is characterised by high per capita consumption and a high level of
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13 104 problematic drinking patterns. While surveys consistently report that 20–25% of Irish adults
14
15 105 abstain from alcohol,^{6, 7} the most recent available figures indicate that Ireland is the sixth
16
17 106 heaviest drinking nation among Organisation for Economic Co-operation and Development
18
19 107 (OECD) countries in terms of the overall volume of alcohol consumed.⁸ The World Health
20
21 108 Organization (WHO) reported in 2018 that 41% of all Irish people aged 15 years and over had
22
23 109 engaged in heavy episodic drinking or RSOD in the past 30 days, placing Ireland in eighth place
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25 110 among the 194 countries analysed.⁴ Three-quarters of all alcohol consumed in Ireland is done
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27 111 so as part of a RSOD session.⁶
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35 113 While it is accepted that patterns of alcohol consumption in Ireland are a cause for concern,
36
37 114 it is not clear if Irish people are actually aware of the extent of their hazardous or harmful
38
39 115 pattern of drinking. If it is the case that people are not aware of their drinking pattern this
40
41 116 suggests that interventions to increase awareness in Ireland may be required. In Australia,
42
43 117 awareness of drinking is low with most people, regardless of their drinking pattern,
44
45 118 considering themselves to be an occasional, light or social drinker. Risky drinkers were less
46
47 119 likely than low-risk drinkers to be aware of what constituted risky drinking.⁹ Irish research
48
49 120 indicates that those most likely to experience alcohol-related harm are those who are alcohol
50
51 121 dependent followed by those who engage in regular RSOD.¹⁰ Given the relationship between
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53 122 drinking pattern and alcohol-related harm in Ireland, the aim of this study was to determine
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55 123 awareness of drinking patterns in an Irish population using a representative random sample
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3 124 and to identify characteristics associated with self-awareness of hazardous or harmful
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6 125 drinking.

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10 127 **Methods**

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13 128 ***Sampling and study population***

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15 129 We analysed data from Ireland's 2014/15 Drug Prevalence Survey. This national survey
16
17
18 130 recruited a stratified clustered sample of 7,005 individuals aged 15 years and over, living in
19
20 131 private households in Ireland. The sampling frame used was the GeoDirectory, which is a list
21
22
23 132 of all addresses in the Republic of Ireland, and distinguishes between residential and
24
25 133 commercial establishments. A three-stage process was used to construct the sample for this
26
27
28 134 survey. The first stage involved stratifying the population into 10 former health board regions
29
30 135 in Ireland. In the second stage of stratification, 421 electoral divisions were selected as the
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32
33 136 primary sampling units across the 10 former health board regions. Before selection, the
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35 137 primary sampling units were ranked by the following socio-demographic indicators:
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37 138 population density, male unemployment and social class, to ensure that a representative
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40 139 cross-section of areas were included. Finally, in each primary sampling unit, 31 addresses
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43 140 were chosen randomly, and at each address, one person was selected to participate in the
44
45 141 survey, using the 'last birthday' rule, whereby, the person whose birthday occurred most
46
47 142 recently was selected. The achieved sample was weighted by gender, age and former health
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49
50 143 board region to maximise its representativeness of the general population. A more
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52 144 comprehensive description of the survey's methodology has been detailed elsewhere.¹¹ The
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54 145 survey involved a face-to-face interview in the participants' home and a self-completion
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57 146 questionnaire. Respondents also self-completed questions in relation to alcohol dependence
58
59 147 and their perception of their own drinking pattern. The home interviews were conducted by
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3 148 trained interviewers using Computer Assisted Personal Interviewing (CAPI). Interviews were
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6 149 completed between August 2014 and August 2015, and achieved a 61% response rate. No
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8 150 data on non-respondents were collected. The survey was granted ethical approval by the
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10
11 151 Royal College of Physicians in Ireland and all participants gave written informed consent.
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153 ***Definitions of drinking patterns***

154 Current drinkers were defined as those who had consumed alcohol at least once in the last
155 12 months. Non-drinkers, categorised as those who had not consumed alcohol in the past
156 year (n=1,608), were excluded from this study.
157

158 *Hazardous drinking – Regular RSOD in the past year*

159 There are no internationally agreed definitions on how much alcohol constitutes a RSOD
160 episode or on what is regular RSOD. We defined RSOD as consuming 60g of pure alcohol on a
161 single drinking occasion similar to the WHO definition.¹² Respondents were asked how often
162 they had consumed the equivalent of six standard drinks on a single drinking occasion in the
163 past year. In Ireland, a standard drink contains 10g of pure alcohol. Frequency of RSOD was
164 measured as follows: daily, 5–6 times a week, 4 times a week, 3 times a week, 2 times a week,
165 once a week, 2–3 times a month, once a month, 6–11 times a year, 2–5 times a year and once
166 a year. The concept of a standard drink and what constitutes 60g of alcohol was explained in
167 detail to each respondent and visual aids were provided depicting 60g of alcohol according to
168 beverage type. We defined hazardous drinkers as those who engaged in RSOD at least
169 monthly in the previous 12 months, but who did not meet the criteria for alcohol dependence
170 (Box 1).
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3 172 *Harmful drinking – alcohol dependence*
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6 173 Alcohol dependence was defined according to DSM-IV criteria, and was measured via self-
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8 174 completed questionnaire using the ten items that denote alcohol dependence from the
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10 175 Composite International Diagnostic Interview, an instrument that is used in many general
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12 176 population studies.¹³ Alcohol dependence was established from a positive response in three
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14 177 or more of the seven domains on the DSM-IV diagnostic criteria in the twelve months before
15
16 178 the interview.¹⁴ Harmful drinkers were defined as those who met the criteria for alcohol
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18 179 dependence, regardless of their RSOD status. Drinkers who met the criteria for both regular
19
20 180 RSOD and alcohol dependence were assigned to the alcohol dependence/harmful drinking
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22 181 type. Respondents who did not have complete data on RSOD and a DSM-IV score (n=236)
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24 182 were excluded from the analysis.
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32 184 *Low-risk drinking*
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35 185 For this study, low-risk drinking was defined as drinking that did not fit our criteria of
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37 186 hazardous or harmful drinking i.e. those drinkers who were not alcohol dependent and who
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39 187 also did not engage in regular RSOD.
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44 189 *Self-perception of own drinking*
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47 190 Drinkers were asked to describe their own drinking by selecting one of the following six
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49 191 statements: 'I am a heavy drinker'; 'I am a heavy drinker and sometimes I binge drink'; 'I am
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51 192 a moderate drinker'; 'I am a moderate drinker and sometimes I binge drink'; 'I am a light
52
53 193 drinker'; or 'I am a light drinker and sometimes I binge drink'. This question was cognitively
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55 194 tested prior to the survey and the wording used reflects the feedback received from the
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57 195 participants following the cognitive testing exercise on their understanding of the terms used.
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3 196 This question was answered by respondents via self-completed questionnaire. No
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6 197 descriptions of the terms 'light', 'moderate', 'heavy' or 'binge' were provided to respondents.
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8 198 The terms 'light' and 'moderate' were used in this question instead of 'low-risk,' and 'binge'
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10 199 was used instead of RSOD as they are terms typically used by the general public in Ireland.
11
12
13 200 This was also reflected in the cognitive testing of the questionnaire which found that
14
15 201 respondents were more familiar with the terms 'light', 'moderate' and 'binge'.. For ease of
16
17
18 202 analysis and to allow us to make comparisons with the three drinking patterns we measured
19
20 203 i.e. low-risk, hazardous, and harmful drinking, we collapsed the six statements into three
21
22
23 204 groups. We combined the categories '*I am a light drinker*' and '*I am a moderate drinker*'; the
24
25 205 categories '*I am a light drinker and sometimes I binge drink*' and '*I am a moderate drinker and*
26
27 206 *sometimes I binge drink*'; and the categories '*I am a heavy drinker*' and '*I am a heavy drinker*
28
29 207 *and sometimes I binge drink*'. We then compared respondents' self-perception of their own
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32 208 drinking against their drinking patterns as measured elsewhere in the questionnaire through
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34
35 209 the RSOD and DSM-IV questions (Box 2).
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211 *Awareness of hazardous and harmful drinking*

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

220

221 **Statistical analysis**

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

230

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

241

242 **Results**243 *Drinking patterns of respondents*

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3 244 Of the 7,005 survey respondents, 5,397 (77.0%, 95% CI: 75.7–78.3) had consumed alcohol in
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6 245 the last year; among current, or last year drinkers, a drinking pattern could be assigned to
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8 246 5,144. Just over half (51.6%, 95% CI: 49.9–53.2) of drinkers were low-risk drinkers, 38% (95%
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10 247 CI: 36.4–39.6) engaged in regular RSOD, and 10.5% (95% CI: 9.4–11.6) were dependent
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13 248 drinkers. Table 1 presents the characteristics of drinkers by drinking pattern. Men accounted
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15 249 for 51.7% of drinkers, 56.3% of drinkers were employed and 48.8% had completed third level
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18 250 education. Low-risk drinkers were predominantly female, aged over 35 years and married.
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20 251 The characteristics of regular RSOD and dependent drinkers were similar; they were more
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23 252 likely to be male, young and single. Low-risk drinkers were most likely to have dependent
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25 253 children (42.6%). The likelihood of engaging in other addictive behaviours increased as
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28 254 hazardous/harmful drinking pattern increased. Smoking was observed in 18.5% of low-risk
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30 255 drinkers, compared to 31.1% of RSOD drinkers and 49.6% of dependent drinkers. Illicit drug
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33 256 use was observed in 2.8% of low-risk drinkers, 11.6% of RSOD drinkers and 33.9% of
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35 257 dependent drinkers, while the respective figures for gambling were 26.4%, 41.4% and 56.6%.
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37 258 The three drinking pattern categories differed with statistical significance for all variables with
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39
40 259 the exception of education.

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

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

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3 268 themselves as light or moderate drinkers. Just 35.1% of regular RSOD drinkers stated that
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5 269 they sometimes engaged in binge drinking and just 16% of dependent drinkers described
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8 270 themselves as a heavy drinker. A similar trend was observed among males and females.
9
10 271 However, dependent female drinkers were less likely than males to describe themselves as a
11
12 272 heavy drinker (11.4% vs. 18.7%). There were 426 (16.2%) low-risk drinkers and 29 (1.5%)
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14 273 regular RSOD drinkers who over-estimated their drinking pattern.
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20 275 *Awareness of own drinking among hazardous/harmful drinkers*
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23 276 Of those who had a hazardous or harmful pattern of drinking (n=2,420), 67.9% were unaware
24
25 277 of this and misclassified themselves as being either a light or moderate drinker. Self-
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27 278 awareness of hazardous or harmful drinking pattern by socio-economic demographics and
28
29 279 other addictive behaviours is presented in Table 3. In unadjusted analyses, respondents who
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31 280 were younger, who had completed secondary or third level education, and those who had
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33 281 engaged in illicit drug use and gambling in the previous year were significantly more likely to
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35 282 be aware that their drinking pattern was hazardous or harmful. Survey participants who were
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37 283 older, married and who were engaged in home duties or retired were significantly less likely
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39 284 to be aware that their drinking pattern was hazardous or harmful.
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286 An adjusted logistic regression model identified that respondents aged 65 years and over
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288 were 0.3 times (95% CI: 0.14–0.65) as likely to be aware of their hazardous or harmful drinking
289
290 pattern compared to those aged 15–24 years (Table 4). Higher education was also associated
291
292 with self-awareness of hazardous or harmful drinking in multivariable analysis, with those
293
294 who had completed third level education being 1.8 times (95% CI: 1.30–4.60) more likely to
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296 be aware compared to those who had completed primary education only. Participants who

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3 292 were aware of their hazardous or harmful drinking pattern were also more likely to engage in
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6 293 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
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8 294 *c* statistic for a model which included these variables was 0.65 (95% CI: 0.63–0.68).
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12 13 296 *Patient and public involvement*

14
15 297 No patient involved.
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19 20 299 **Discussion**

21 22 300 *Main findings of the study*

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25 301 The results of this nationally representative study of 7,005 respondents suggest that patterns
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27 302 of alcohol use in Ireland are problematic. Almost half of all drinkers either engage in frequent
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29 303 RSOD (38%) or score positive for alcohol dependence (10.5%). In addition to hazardous and
30
31 304 harmful drinking patterns being commonplace in Ireland, this study finds that a majority of
32
33 305 those who engage in such patterns of drinking are unaware of this. Low-risk drinkers were
34
35 306 mostly aware of their own pattern of drinking, although 16.2% overestimated their drinking
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37 307 pattern. In comparison, awareness of drinking pattern was low for regular RSOD drinkers and
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39 308 for dependent drinkers. One-third (33.8%) of drinkers with a positive DSM-IV score self-
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41 309 categorised themselves as being either a light or moderate drinker and a further 50.3%
42
43 310 described themselves as a light or moderate drinker who sometimes binge drinks. Given that
44
45 311 alcohol dependence is a maladaptive pattern of alcohol consumption, manifested by
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47 312 symptoms leading to clinically significant impairment¹⁵, it is particularly concerning that so
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49 313 many Irish people with alcohol dependence believe themselves to be light or moderate
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51 314 drinkers. Our adjusted regression analysis found that factors independently associated with
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53 315 self-awareness of hazardous or harmful drinking pattern were having a higher educational
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3 316 level and engaging in risk taking behaviours, such as illicit drug use and gambling, while those
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6 317 aged 65 and over were significantly less likely to be aware of their hazardous or harmful
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8 318 drinking pattern. Nevertheless, the c statistic demonstrated that the ability of our model to
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10 319 separate cases from non-cases was poor. This indicates that there are likely to be other factors
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13 320 which we have not identified that are associated with awareness of drinking pattern in this
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15 321 population. It is possible that factors not included in this survey such as personality traits may
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17 322 be associated with awareness of drinking pattern and further research is required to identify
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20 323 these factors.
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25 325 *Strengths and limitations*

27 326 To the best of our knowledge this is the first study to attempt to identify factors associated
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29 327 with the public's self-perception of their own drinking with their actual drinking pattern using
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32 328 a general population survey. A further strength is that the survey had a large sample size of
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35 329 7,005, and respondents were selected using a random probability sample that was
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37 330 representative of the Irish population; thus our findings are generalisable to the whole
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40 331 population. We also used valid and reliable measures of hazardous and harmful alcohol
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42 332 consumption, namely the frequency of RSOD and the DSM-IV questionnaire.
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47 334 However, this study has a number of limitations which need to be considered when
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49 335 interpreting the findings. While our results are nationally representative, response bias may
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52 336 also be considered a limitation; general population surveys such as this often fail to recruit
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54 337 the heaviest drinkers, as they may be difficult to contact and if contacted may be less likely to
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56
57 338 agree to participate.¹⁶ Only a limited number of alcohol questions were included in this survey
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59 339 and they used a 12-month reference period, which may lead to reduced recall for
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3 340 respondents. Self-reporting biases are common to alcohol use surveys and lead to
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6 341 underestimation of alcohol consumption. The usual range of coverage from surveys is in the
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8 342 region of 40–60%.^{17, 18} In a 2013 Irish population survey, self-reported alcohol consumption
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10 343 based on ‘typical drink questions’ accounted for just 39% of per capita sales, even though the
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12 344 concept of a standard drink was explained in detail to each respondent and visual aids were
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14 345 provided.⁶ Finally, there were discrepancies between the definitions used to define drinking
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16 346 patterns and the categories that respondents were asked to select from to self-assess their
17
18 347 own drinking. However, it was felt that the alcohol terms typically used in clinical and research
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20 348 settings would not be as easily understood by the general public, and this was corroborated
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22 349 by the cognitive testing of the questionnaire that was undertaken prior to the survey.
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30 351 *Comparison with previous work*

31
32 352 In relation to drinking patterns, the results of this study suggest that Ireland has a high level
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34 353 of RSOD when compared to other countries⁴. The prevalence of alcohol dependence in this
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36 354 study was also high when compared to a study of alcohol dependence in European countries,
37
38 355 although it should be noted that a number of different instruments were used to measure
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40 356 dependence in the European report.¹⁹
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358 The available evidence suggests that knowledge on standard drinks and drinking guidelines
359 both in Ireland and internationally is limited, which may help explain why so few respondents
360 correctly identified their pattern of drinking. Our findings regarding awareness of hazardous
361 and harmful drinking are similar to a recent study in Australia, which reported that 68% of
362 Australian drinkers who consume 11 or more standard drinks on a ‘typical occasion’ consider
363 themselves a ‘responsible drinker’.²⁰ A Swedish study reported low levels of knowledge of

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3 364 standard drink and hazardous drinking concepts among hazardous drinkers.²¹ A review of the
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5 365 literature on standard drinks for the European Joint Action on Alcohol found little
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8 366 understanding of what the term 'standard drink' actually means and that drinkers are not
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10 367 able to define standard drinks accurately.²² A 2012 Irish survey demonstrated that while 58%
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13 368 had heard of the term 'standard drink', just 39% knew how many standard drinks are in a pint
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15 369 of lager and 33% knew how many standard drinks are in a single measure of spirits, which are
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18 370 the typical serving sizes of lager and spirits in Ireland.²³ In the UK, knowledge of the previous
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20 371 drinking guidelines was poor, in spite of them having been in place for 20 years. In 2012, only
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23 372 about one-quarter of people were able to provide a correct estimate of how many units it
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25 373 was recommended their gender should not exceed in a day, which corresponded to a lower
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28 374 level of awareness than in 2009. This suggests that previous efforts to raise awareness of
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30 375 recommended drinking limits have not had lasting effect.²⁴ In Australia 53.5% correctly
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32 376 identified the guideline threshold for women and 20.3% did so for men.²⁵

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37 378 Knowledge on drinking guidelines in Ireland is also poor. In 2012, just 10% of men and 10% of
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40 379 women knew the gender-specific low-risk limits for alcohol consumption.²³ Ireland's
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42 380 guidelines were last reviewed in 2009.²⁶ The current guidelines recommend that men
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45 381 consume no more than 17 standard drinks and women no more than 11 standard drinks
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47 382 spread over the course of a week, with at least two alcohol free days. No guidance is given in
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50 383 relation to daily low-risk limits. These results suggest that further work on educating the Irish
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52 384 public on low-risk drinking limits is required. Given the high prevalence of frequent RSOD in
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54 385 Ireland it may also be appropriate to introduce low-risk daily limits. Drinkers in Ireland tend
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57 386 to consume alcohol relatively infrequently but, on the occasions that they do, they are likely
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59 387 to engage in RSOD. In order for individuals to monitor and be aware of their alcohol

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3 388 consumption, knowledge on the standard drink concept and low-risk drinking guidelines is
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6 389 required. It is unrealistic to expect people to stay within low-risk limits and to be able to
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8 390 accurately assess their own hazardous or harmful drinking in the absence of knowledge on
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10 391 what actually constitutes hazardous or harmful drinking.
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15 393 *Policy implications*

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18 394 Public health messaging can be utilised to provide health guidance regarding alcohol use to
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20 395 the general public. A systematic review on the effectiveness of mass media public health
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22 396 campaigns to reduce alcohol consumption and related harms found evidence that such
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24 397 campaigns can be recalled by individuals and can achieve improvements in knowledge about
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26 398 alcohol. There was no evidence that campaigns led to decreased alcohol consumption but the
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28 399 authors concluded that mass media can yield sustained knowledge, which may lay the
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30 400 groundwork for reductions in consumption that are achieved using other public health
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32 401 measures.²⁷ In Denmark, a repeated annual campaign from 1990 to 2000 increased
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34 402 awareness of low-risk drinking guidelines in all subsets of the population throughout the
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36 403 period.²⁸ Hazardous drinkers were more knowledgeable about the guidelines than low-risk
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38 404 drinkers, which shows that this important target group can be reached. There had been
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40 405 limited public health messaging in Ireland on low-risk drinking prior to 2017, when an alcohol
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42 406 campaign 'Ask About Alcohol' was commenced to provide clear and authoritative information
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44 407 on alcohol to the public across a number of media platforms. The website for this campaign
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46 408 is the first one dedicated to dealing with alcohol to be created by a State body in Ireland. It
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48 409 provides advice on low-risk drinking limits and contains a drinks calculator so the public can
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50 410 understand exactly how much they are drinking and whether it is within low-risk limits.
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3 412 This study demonstrates that further initiatives to reduce overall consumption and hazardous
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6 413 and harmful drinking patterns and raise awareness around drinking patterns are required.
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8 414 Based on the existing systematic review evidence on mass media campaigns,²⁷ simply having
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10 415 a public messaging campaign around hazardous and harmful drinking is insufficient to reduce
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12 416 alcohol consumption and problematic patterns of drinking in an alcogenic culture such as
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14 417 Ireland, where pro-alcohol social norms and alcohol marketing and sponsorship are pervasive.
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16 418 Older people and those with lower educational attainment were less likely to be aware of
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18 419 their hazardous or harmful drinking and efforts should be made to target this group in relation
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20 420 to raising awareness around alcohol use. Our results also suggest that there is a cohort of
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22 421 younger, well-educated drinkers in Ireland who also engage in other potentially risky
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24 422 behaviours and that these subjects are already aware of their hazardous or harmful drinking.
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26 423 Consequently, it is unlikely that public health messaging alone will be sufficient to result in
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28 424 behaviour change for this group in relation to their alcohol use. In 2018, following a
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30 425 protracted process, the Public Health (Alcohol) Act was signed into law. This is the first time
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32 426 that Ireland's harmful use of alcohol will be addressed coherently in public health legislation.
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34 427 The main provisions of the Act include the introduction of a minimum unit price for alcohol,
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36 428 restrictions on the advertising and sponsorship of alcohol products, the structural separation
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38 429 of alcohol from other non-alcohol products in small shops, convenience stores and
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40 430 supermarkets, and labelling of all alcohol products to provide consumers with information on
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42 431 the number of grams of alcohol per container, calorific content, and health warnings. These
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44 432 measures will be enacted over the coming years with the aim of reducing alcohol
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46 433 consumption in Ireland. However, it is important that these initiatives are accompanied by
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48 434 public health messaging. If a comprehensive and sustained public health messaging campaign
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50 435 is implemented alongside the provisions in the Public Health Alcohol Act, the likelihood of
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436 both raising awareness and achieving meaningful reductions in alcohol consumption and
 437 problematic drinking patterns will be increased. It is also imperative that evaluations on the
 438 effectiveness of the legislative measures and the public messaging campaign are undertaken
 439 regularly to assess their impacts.

441 Conclusions

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

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

	All drinkers	Low-risk drinkers	Regular RSOD drinker	Dependent drinkers	P value
Weighted count=5144		N (%)	N (%)	N (%)	
	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 ($P < 0.05$).

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3 447 **Box 1: Drinking pattern assigned to drinkers**
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5 Low-risk – drinkers who did not meet the criteria for alcohol dependence and
6 who had not engaged in monthly RSOD in the past year
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8 Hazardous – drinkers who had engaged in RSOD at least monthly, but did not
9 meet the criteria for alcohol dependence in the past year
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11 Harmful – drinkers who met the DSM-IV criteria for dependence in the past
12 year
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16 449 **Box 2: Self-perception of own drinking**
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19 451 Light/moderate – those who selected one of these statements: *'I am a light*
20 *drinker'* or *'I am a moderate drinker'*
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23 454 Light/moderate and sometimes binge drink – those who selected one of these
24 statements: *'I am a light drinker and sometimes I binge drink'* or *'I am a*
25 *moderate drinker and sometimes I binge drink'*
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27 456 Heavy – those who selected one of these statements: *'I am a heavy drinker'*
28 or *'I am a heavy drinker and sometimes I binge drink'*
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3 468 **Declarations**
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6 469 Ethics approval and consent to participate: Ethical approval for the 2014/15 Drug
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8 470 Prevalence Survey was granted by the Royal College of Physicians Ireland (Ref: RECSAF 21).
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11 471 Consent for publication: Not applicable
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14 472 Availability of data and material: The datasets used and/or analysed during the current
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16 473 study are available from the corresponding author on reasonable request.
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20 474 Competing interests: None
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22

23 475 Funding: Funding was provided by the Department of Health, Ireland
24
25

26 476 Authors' contributions: DM designed the study, analysed the data, and drafted the
27
28 477 manuscript. SM provided statistical support and helped interpret the data. COD undertook a
29
30 478 review of the literature and provided assistance with data analysis. JL was involved in the
31
32 479 design and conception of the study. BG supervised the study. All authors reviewed and
33
34 480 helped to revise successive drafts and approved the final version of the manuscript.
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38 481 Acknowledgements: None
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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

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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	
1			
2	Data sources /	#8	For each variable of interest give sources of data and details of methods of assessment
3	measurement		(measurement). Describe comparability of assessment methods if there is more than one group.
4			Give information separately for for exposed and unexposed groups if applicable.
5			
6			
7			
8	Bias	#9	Describe any efforts to address potential sources of bias
9			n/a
10	Study size	#10	Explain how the study size was arrived at
11			5
12	Quantitative	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which
13	variables		groupings were chosen, and why
14			9
15			
16	Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding
17			9
18	Statistical methods	#12b	Describe any methods used to examine subgroups and interactions
19			9
20	Statistical methods	#12c	Explain how missing data were addressed
21			9
22	Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy
23			9
24	Statistical methods	#12e	Describe any sensitivity analyses
25			n/a
26			
27			
28	Results		
29			
30	Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible,
31			examined for eligibility, confirmed eligible, included in the study, completing follow-up, and
32			analysed. Give information separately for for exposed and unexposed groups if applicable.
33			10
34	Participants	#13b	Give reasons for non-participation at each stage
35			10
36	Participants	#13c	Consider use of a flow diagram
37			n/a
38			
39	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on
40			exposures and potential confounders. Give information separately for exposed and unexposed
41			groups if applicable.
42			10
43	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest
44			Table 1
45	Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for
46			exposed and unexposed groups if applicable.
47			10-12
48	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision
49			(eg, 95% confidence interval). Make clear which confounders were adjusted for and why they
50			were included
51			11-12
52	Main results	#16b	Report category boundaries when continuous variables were categorized
53			10-12
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1	Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
2				
3				
4	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	10-12
5				
6				
7				
8	Discussion			
9				
10				
11	Key results	#18	Summarise key results with reference to study objectives	12
12				
13	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
14				
15				
16				
17	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	14
18				
19				
20				
21	Generalisability	#21	Discuss the generalisability (external validity) of the study results	13, 15
22				
23				
24	Other			
25	Information			
26				
27	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
28				
29				
30				

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BMJ Open

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

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2019-034520.R2
Article Type:	Original research
Date Submitted by the Author:	21-Apr-2020
Complete List of Authors:	Mongan, Deirdre; Health Research Board, Millar, Sean; Health Research Board; University College Cork, School of Public Health O'Dwyer, Claire; Health Research Board, Evidence Centre Long, Jean; Health Research Board Galvin, Brian; Health Research Board
Primary Subject Heading:	Public health
Secondary Subject Heading:	Epidemiology, Health policy
Keywords:	alcohol, consumption, hazardous, drinking patterns, self-awareness

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1
2
3 1 **Title page**
4

5 2 **Title: Drinking in denial: a cross sectional analysis of national survey data in Ireland to**
6 **measure drinkers' awareness of their alcohol use**
7
8

9 4
10
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20 13 **Keywords:** Alcohol; Consumption; Hazardous; Drinking patterns; Self-Awareness
21
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23 14
24 15 **Running Title:** Drinking in denial: Irish drinkers' self-perception of their alcohol use
25
26

27 16
28 17 **Research Ethics Approval:** Granted by the Royal College of Physicians Ireland (Ref: RECSAF
29 18 21)
30

31 19
32 20 **Contributorship statement:** DM designed the study, analysed the data, and drafted the
33 21 manuscript. SM provided statistical support and helped interpret the data. COD undertook a
34 22 review of the literature and provided assistance with data analysis. JL was involved in the
35 23 design and conception of the study. BG supervised the study. All authors reviewed and
36 24 helped to revise successive drafts and approved the final version of the manuscript.
37
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1
2
3 29 **Abstract**
4

5 30 **Objectives:** Ireland has high per capita alcohol consumption and also has high levels of
6
7
8 31 problematic drinking patterns. While it is accepted that patterns of alcohol consumption in
9
10 32 Ireland are a cause for concern, it is not clear if Irish people are actually aware of the extent
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12
13 33 of their hazardous or harmful pattern of drinking. The aim of this study was to determine
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15 34 awareness of drinking pattern in an Irish population using a representative random sample
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17
18 35 and to identify characteristics associated with self-awareness of hazardous or harmful
19
20 36 drinking.
21
22

23 37
24
25 38 **Methods:** We analysed data from Ireland's 2014/15 Drug Prevalence Survey which recruited
26
27 39 a stratified clustered sample of 7,005 individuals aged 15 years and over living in private
28
29
30 40 households. Logistic regression analysis was used to determine characteristics associated
31
32 41 with self-awareness of hazardous or harmful drinking.
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34

35 42
36
37 43 **Results:** Almost one half of drinkers had a hazardous or harmful pattern of drinking; 38%
38
39 44 engaged in monthly risky single occasion drinking (RSOD) and 10.5% met DSM-IV for alcohol
40
41 45 dependence. Of the 2,420 respondents who had a hazardous or harmful pattern of drinking,
42
43 46 67% were unaware of this and misclassified themselves as being either a light or moderate
44
45 47 drinker who did not engage in risky single occasion drinking. An adjusted logistic regression
46
47 48 model identified that hazardous and harmful drinkers were more likely to be aware of their
48
49 49 drinking pattern if they had completed third level education (OR = 1.80, 95% CI: 1.30–2.49)
50
51 50 while older drinkers (aged 65 and over) were less likely to be aware of their drinking pattern
52
53 51 (OR = 0.30, 95% CI: 0.14–0.65). Subjects who engaged in risk taking behaviours such as illicit
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3 52 drug use and gambling were also significantly more likely to be aware of their drinking
4
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6 53 pattern.
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10 55 **Conclusions:** The results of this study suggest that patterns of alcohol use in Ireland are
11
12
13 56 problematic. Older respondents and those with lower educational attainment are less likely
14
15
16 57 to be aware of their hazardous or harmful drinking pattern. There is also a population of
17
18 58 younger, more-educated drinkers who engage in potentially risk-taking behaviours and these
19
20 59 subjects are aware of their harmful drinking pattern. Initiatives to reduce overall alcohol
21
22
23 60 consumption and raise awareness around drinking patterns are required.
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27 62 **Strengths and limitations of this study**

- 29 63 • This was a large national survey which was representative of the Irish population.
- 30 64 • The study employed standardised methods for the measurement of hazardous and
31
32 65 harmful alcohol consumption.
- 33 66 • Although the overall response rate was good, alcohol surveys often fail to recruit the
34
35 67 heaviest drinkers, resulting in selection bias.
- 36 68 • There were discrepancies between the definitions used to define drinking patterns
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38 69 and the categories that respondents were asked to select from to self-assess their own
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40 70 drinking
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76 Introduction

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

92
93 Alcohol use in Ireland is characterised by high per capita consumption and a high level of
94 problematic drinking patterns. While surveys consistently report that 20–25% of Irish adults
95 abstain from alcohol,^{6, 7} the most recent available figures indicate that Ireland is the sixth
96 heaviest drinking nation among Organisation for Economic Co-operation and Development
97 (OECD) countries in terms of the overall volume of alcohol consumed.⁸ The World Health
98 Organization (WHO) reported in 2018 that 41% of all Irish people aged 15 years and over had
99 engaged in heavy episodic drinking or RSOD in the past 30 days, placing Ireland in eighth place

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3 100 among the 194 countries analysed.⁴ Three-quarters of all alcohol consumed in Ireland is done
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6 101 so as part of a RSOD session.⁶
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10 103 While it is accepted that patterns of alcohol consumption in Ireland are a cause for concern,
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12
13 104 it is not clear if Irish people are actually aware of the extent of their hazardous or harmful
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15 105 pattern of drinking. If it is the case that people are not aware of their drinking pattern this
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17
18 106 suggests that interventions to increase awareness in Ireland may be required. In Australia,
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20 107 awareness of drinking is low with most people, regardless of their drinking pattern,
21
22
23 108 considering themselves to be an occasional, light or social drinker. Risky drinkers were less
24
25 109 likely than low-risk drinkers to be aware of what constituted risky drinking.⁹ Irish research
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27
28 110 indicates that those most likely to experience alcohol-related harm are those who are alcohol
29
30 111 dependent followed by those who engage in regular RSOD.¹⁰ Given the relationship between
31
32
33 112 drinking pattern and alcohol-related harm in Ireland, the aim of this study was to determine
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35 113 awareness of drinking patterns in an Irish population using a representative random sample
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37
38 114 and to identify characteristics associated with self-awareness of hazardous or harmful
39
40 115 drinking.
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42 116

43 44 45 117 **Methods**

46 47 118 ***Sampling and study population***

48
49 119 We analysed data from Ireland's 2014/15 Drug Prevalence Survey. This national survey
50
51
52 120 recruited a stratified clustered sample of 7,005 individuals aged 15 years and over, living in
53
54
55 121 private households in Ireland. The sampling frame used was the GeoDirectory, which is a list
56
57 122 of all addresses in the Republic of Ireland, and distinguishes between residential and
58
59 123 commercial establishments. A three-stage process was used to construct the sample for this
60

1
2
3 124 survey. The first stage involved stratifying the population into 10 former health board regions
4
5
6 125 in Ireland. In the second stage of stratification, 421 electoral divisions were selected as the
7
8 126 primary sampling units across the 10 former health board regions. Before selection, the
9
10
11 127 primary sampling units were ranked by the following socio-demographic indicators:
12
13 128 population density, male unemployment and social class, to ensure that a representative
14
15 129 cross-section of areas were included. Finally, in each primary sampling unit, 31 addresses
16
17
18 130 were chosen randomly, and at each address, one person was selected to participate in the
19
20
21 131 survey, using the 'last birthday' rule, whereby, the person whose birthday occurred most
22
23 132 recently was selected. The achieved sample was weighted by gender, age and former health
24
25 133 board region to maximise its representativeness of the general population. A more
26
27
28 134 comprehensive description of the survey's methodology has been detailed elsewhere.¹¹ The
29
30 135 survey involved a face-to-face interview in the participants' home and a self-completion
31
32
33 136 questionnaire. Respondents also self-completed questions in relation to alcohol dependence
34
35 137 and their perception of their own drinking pattern. The home interviews were conducted by
36
37
38 138 trained interviewers using Computer Assisted Personal Interviewing (CAPI). Interviews were
39
40 139 completed between August 2014 and August 2015, and achieved a 61% response rate. No
41
42
43 140 data on non-respondents were collected. The survey was granted ethical approved by the
44
45 141 Royal College of Physicians in Ireland and all participants gave written informed consent.

142

143 ***Definitions of drinking patterns***

144 Current drinkers were defined as those who had consumed alcohol at least once in the last
145
146 12 months. Non-drinkers, categorised as those who had not consumed alcohol in the past
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157 146 year (n=1,608), were excluded from this study.

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3 148 *Hazardous drinking – Regular RSOD in the past year*
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5
6 149 There are no internationally agreed definitions on how much alcohol constitutes a RSOD
7
8 150 episode or on what is regular RSOD. RSOD is referred to as ‘heavy episodic drinking’ by the
9
10 151 World Health Organization, and is also commonly known as ‘binge drinking’. We defined
11
12 152 RSOD as consuming 60g of pure alcohol on a single drinking occasion similar to the WHO
13
14 153 definition.¹² Respondents were asked how often they had consumed the equivalent of six
15
16 154 standard drinks on a single drinking occasion in the past year. In Ireland, a standard drink
17
18 155 contains 10g of pure alcohol. Frequency of RSOD was measured as follows: daily, 5–6 times a
19
20 156 week, 4 times a week, 3 times a week, 2 times a week, once a week, 2–3 times a month, once
21
22 157 a month, 6–11 times a year, 2–5 times a year and once a year. The concept of a standard drink
23
24 158 and what constitutes 60g of alcohol was explained in detail to each respondent and visual
25
26 159 aids were provided depicting 60g of alcohol according to beverage type. We defined
27
28 160 hazardous drinkers as those who engaged in RSOD at least monthly in the previous 12 months,
29
30 161 but who did not meet the criteria for alcohol dependence (Box 1).
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40 163 *Harmful drinking – alcohol dependence*
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42 164 Alcohol dependence was defined according to DSM-IV criteria, and was measured via self-
43
44 165 completed questionnaire using the ten items that denote alcohol dependence from the
45
46 166 Composite International Diagnostic Interview, an instrument that is used in many general
47
48 167 population studies.¹³ Alcohol dependence was established from a positive response in three
49
50 168 or more of the seven domains on the DSM-IV diagnostic criteria in the twelve months before
51
52 169 the interview.¹⁴ Harmful drinkers were defined as those who met the criteria for alcohol
53
54 170 dependence, regardless of their RSOD status. Drinkers who met the criteria for both regular
55
56 171 RSOD and alcohol dependence were assigned to the alcohol dependence/harmful drinking
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2
3 172 type. Respondents who did not have complete data on RSOD and a DSM-IV score (n=236)
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5
6 173 were excluded from the analysis.
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10 175 *Low-risk drinking*

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13 176 For this study, low-risk drinking was defined as drinking that did not fit our criteria of
14
15 177 hazardous or harmful drinking i.e. those drinkers who were not alcohol dependent and who
16
17
18 178 also did not engage in regular RSOD.
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22 180 *Self-perception of own drinking*

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24
25 181 Drinkers were asked to describe their own drinking by selecting one of the following six
26
27 182 statements: '*I am a heavy drinker*'; '*I am a heavy drinker and sometimes I binge drink*'; '*I am*
28
29 183 *a moderate drinker*'; '*I am a moderate drinker and sometimes I binge drink*'; '*I am a light*
30
31 184 *drinker*'; or '*I am a light drinker and sometimes I binge drink*'. This question was cognitively
32
33
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35 185 tested prior to the survey and the wording used reflects the feedback received from the
36
37 186 participants following the cognitive testing exercise on their understanding of the terms used.
38
39
40 187 This question was answered by respondents via self-completed questionnaire. No
41
42 188 descriptions of the terms 'light', 'moderate', 'heavy' or 'binge' were provided to respondents.
43
44 189 The terms 'light' and 'moderate' were used in this question instead of 'low-risk,' and 'binge'
45
46 190 was used instead of RSOD as they are terms typically used by the general public in Ireland.
47
48
49
50 191 This was also reflected in the cognitive testing of the questionnaire which found that
51
52 192 respondents were more familiar with the terms 'light', 'moderate' and 'binge'. For ease of
53
54 193 analysis and to allow us to make comparisons with the three drinking patterns we measured
55
56
57 194 i.e. low-risk, hazardous, and harmful drinking, we collapsed the six statements into three
58
59 195 groups. We combined the categories '*I am a light drinker*' and '*I am a moderate drinker*'; the

1
2
3 196 categories 'I am a light drinker and sometimes I binge drink' and 'I am a moderate drinker and
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5
6 197 sometimes I binge drink'; and the categories 'I am a heavy drinker' and 'I am a heavy drinker
7
8 198 and sometimes I binge drink'. We then compared respondents' self-perception of their own
9
10
11 199 drinking against their drinking patterns as measured elsewhere in the questionnaire through
12
13 200 the RSOD and DSM-IV questions (Box 2).

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15 201

16 201 17 18 202 *Awareness of hazardous and harmful drinking*

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20 203 For this part of the analysis we only included those respondents who were classified as
21
22
23 204 hazardous/RSOD or harmful/dependant drinkers (n=2,420). Respondents were considered to
24
25 205 be unaware of their own hazardous and harmful drinking if they incorrectly underestimated
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27
28 206 their drinking pattern i.e. those regular RSOD drinkers who classified themselves as light or
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30 207 moderate drinkers who do not binge drink and dependent drinkers who classified themselves
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32
33 208 as light or moderate drinkers who may or may not sometimes binge drink. Respondents were
34
35 209 considered to be aware of their own hazardous or harmful drinking pattern if they described
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37
38 210 themselves as sometimes binge drinking or as a heavy drinker.

39
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41 42 212 **Statistical analysis**

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44
45 213 The distribution of drinking pattern was analysed by socio-demographic and addictive
46
47 214 behaviour variables that are associated with alcohol. The socio-demographic variables
48
49
50 215 analysed were age, sex, marital status, education, employment, region, dependent children;
51
52 216 and the addictive behaviour variables analysed were smoking status (defined as being a
53
54
55 217 current smoker), last year gambling (excluding lottery), and last year illicit drug use. This was
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57 218 analysed by cross-tabulation and statistical significance was assessed by the Pearson χ^2 test.

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3 219 Cross-tabulation was used to compare the drinking pattern of respondents as measured using
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6 220 the RSOD and DSM-IV questions with their self-perceived drinking pattern.
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10 222 Univariate logistic regression analyses were performed to determine factors associated with
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13 223 self-awareness of drinking pattern. Those variables which were identified as being significant
14
15 224 or borderline significant ($P < 0.1$) were then entered into a multivariable logistic regression
16
17
18 225 model which was used to estimate adjusted odds ratios of being self-aware of hazardous or
19
20 226 harmful drinking. This model was adjusted for gender, age, marital status, education,
21
22
23 227 employment, illicit drug use, and gambling. The ability of variables identified in multivariable
24
25 228 analysis to separate cases from non-cases was evaluated using the *c* statistic. For all analyses,
26
27
28 229 a *P* value of less than 0.05 was considered to indicate statistical significance. Data were
29
30 230 analysed using Stata Version 15.1 (Stata Corporation, College Station, TX, USA). Results are
31
32 231 displayed using weighted data.
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35 232

37 233 **Results**

40 234 *Drinking patterns of respondents*

41
42 235 Of the 7,005 survey respondents, 5,397 (77.0%, 95% CI: 75.7–78.3) had consumed alcohol in
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44
45 236 the last year; among current, or last year drinkers, a drinking pattern could be assigned to
46
47 237 5,144. Just over half (51.6%, 95% CI: 49.9–53.2) of drinkers were low-risk drinkers, 38% (95%
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49
50 238 CI: 36.4–39.6) engaged in regular RSOD, and 10.5% (95% CI: 9.4–11.6) were dependent
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52 239 drinkers. Table 1 presents the characteristics of drinkers by drinking pattern. Men accounted
53
54 240 for 51.7% of drinkers, 56.3% of drinkers were employed and 48.8% had completed third level
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57 241 education. Low-risk drinkers were predominantly female, aged over 35 years and married.
58
59 242 The characteristics of regular RSOD and dependent drinkers were similar; they were more
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3 243 likely to be male, young, and single. Low-risk drinkers were most likely to have dependent
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5 244 children (42.6%). The likelihood of engaging in other addictive behaviours increased as
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8 245 hazardous/harmful drinking pattern increased. Smoking was observed in 18.5% of low-risk
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10 246 drinkers, compared to 31.1% of RSOD drinkers and 49.6% of dependent drinkers. Illicit drug
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12
13 247 use was observed in 2.8% of low-risk drinkers, 11.6% of RSOD drinkers and 33.9% of
14
15 248 dependent drinkers, while the respective figures for gambling were 26.4%, 41.4% and 56.6%.
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17
18 249 The three drinking pattern categories differed with statistical significance for all variables with
19
20 250 the exception of education.
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25 252 *Self-perception of own drinking and comparison with own drinking pattern*

27 253 Information on drinking pattern and self-defined drinking category was available for 5,053
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29
30 254 respondents. The majority of drinkers (70.9%) classified themselves as light or moderate
31
32 255 drinkers who do not binge drink, 26.7% categorised themselves as light or moderate drinkers
33
34 256 who sometimes binge drink, and 2.4% classified themselves as heavy drinkers (Table 2). Most
35
36
37 257 low-risk drinkers (83.8%) described themselves as light or moderate drinkers. Almost two-
38
39
40 258 thirds of regular RSOD drinkers and one-third (33.8%) of dependent drinkers described
41
42 259 themselves as light or moderate drinkers. Just 35.1% of regular RSOD drinkers stated that
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44
45 260 they sometimes engaged in binge drinking and just 16% of dependent drinkers described
46
47 261 themselves as a heavy drinker. A similar trend was observed among males and females.
48
49
50 262 However, dependent female drinkers were less likely than males to describe themselves as a
51
52 263 heavy drinker (11.4% vs. 18.7%). There were 426 (16.2%) low-risk drinkers and 29 (1.5%)
53
54 264 regular RSOD drinkers who over-estimated their drinking pattern.
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57 265

59 266 *Awareness of own drinking among hazardous/harmful drinkers*

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3 267 Of those who had a hazardous or harmful pattern of drinking (n=2,420), 67.9% were unaware
4
5
6 268 of this and misclassified themselves as being either a light or moderate drinker. Self-
7
8 269 awareness of hazardous or harmful drinking pattern by socio-economic demographics and
9
10 270 other addictive behaviours is presented in Table 3. In unadjusted analyses, respondents who
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12
13 271 were younger, who had completed secondary or third level education, and those who had
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15 272 engaged in illicit drug use and gambling in the previous year were significantly more likely to
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18 273 be aware that their drinking pattern was hazardous or harmful. Survey participants who were
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20 274 older, married and who were engaged in home duties or retired were significantly less likely
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23 275 to be aware that their drinking pattern was hazardous or harmful.
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277 An adjusted logistic regression model identified that respondents aged 65 years and over
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30 278 were 0.3 times (95% CI: 0.14–0.65) as likely to be aware of their hazardous or harmful drinking
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33 279 pattern compared to those aged 15–24 years (Table 4). Higher education was also associated
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35 280 with self-awareness of hazardous or harmful drinking in multivariable analysis, with those
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37 281 who had completed third level education being 1.8 times (95% CI: 1.30–4.60) more likely to
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40 282 be aware compared to those who had completed primary education only. Participants who
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42 283 were aware of their hazardous or harmful drinking pattern were also more likely to engage in
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45 284 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
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47 285 c statistic for a model which included these variables was 0.65 (95% CI: 0.63–0.68).
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52 287 *Patient and public involvement*

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54 288 No patient involved.
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59 290 **Discussion**

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3 291 *Main findings of the study*
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6 292 The results of this nationally representative study of 7,005 respondents suggest that patterns
7
8 293 of alcohol use in Ireland are problematic. Almost half of all drinkers either engage in frequent
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10 294 RSOD (38%) or score positive for alcohol dependence (10.5%). In addition to hazardous and
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12 295 harmful drinking patterns being commonplace in Ireland, this study finds that a majority of
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14 296 those who engage in such patterns of drinking are unaware of this. Low-risk drinkers were
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16 297 mostly aware of their own pattern of drinking, although 16.2% overestimated their drinking
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18 298 pattern. In comparison, awareness of drinking pattern was low for regular RSOD drinkers and
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20 299 for dependent drinkers. One-third (33.8%) of drinkers with a positive DSM-IV score self-
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22 300 categorised themselves as being either a light or moderate drinker and a further 50.3%
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24 301 described themselves as a light or moderate drinker who sometimes binge drinks. Given that
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26 302 alcohol dependence is a maladaptive pattern of alcohol consumption, manifested by
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28 303 symptoms leading to clinically significant impairment¹⁵, it is particularly concerning that so
29
30 304 many Irish people with alcohol dependence believe themselves to be light or moderate
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32 305 drinkers. Our adjusted regression analysis found that the factors independently associated
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34 306 with self-awareness of hazardous or harmful drinking pattern were having a higher
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36 307 educational level and engaging in risk taking behaviours, such as illicit drug use and gambling,
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38 308 while those aged 65 and over were significantly less likely to be aware of their hazardous or
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40 309 harmful drinking pattern. Nevertheless, the *c* statistic demonstrated that the ability of our
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42 310 model to separate cases from non-cases was poor. This indicates that there are likely to be
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44 311 other factors which we have not identified that are associated with awareness of drinking
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46 312 pattern in this population. It is possible that factors not included in this survey such as
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48 313 personality traits may be associated with awareness of drinking pattern and further research
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50 314 is required to identify these factors.
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316 *Strengths and limitations*

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

324

325 However, this study has a number of limitations which need to be considered when
326 interpreting the findings. While our results are nationally representative, response bias may
327 also be considered a limitation; general population surveys such as this often fail to recruit
328 the heaviest drinkers, as they may be difficult to contact and if contacted may be less likely to
329 agree to participate.¹⁶ Only a limited number of alcohol questions were included in this survey
330 and they used a 12-month reference period, which may lead to reduced recall for
331 respondents. This survey included the AUDIT-C, but not the full AUDIT. As so many drinkers
332 (73% of men and 41% of women) met the criteria for hazardous drinking using the AUDIT-C,
333 we felt that using measures of RSOD and dependence to denote hazardous and harmful
334 drinking was more appropriate. Self-reporting biases are common to alcohol use surveys and
335 lead to underestimation of alcohol consumption. The usual range of coverage from surveys is
336 in the region of 40–60%.^{17, 18} In a 2013 Irish population survey, self-reported alcohol
337 consumption based on 'typical drink questions' accounted for just 39% of per capita sales,
338 even though the concept of a standard drink was explained in detail to each respondent and

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3 339 visual aids were provided.⁶ Finally, there were discrepancies between the definitions used to
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6 340 define drinking patterns and the categories that respondents were asked to select from to
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8 341 self-assess their own drinking. However, it was felt that the alcohol terms typically used in
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10 342 clinical and research settings would not be as easily understood by the general public, and
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13 343 this was corroborated by the cognitive testing of the questionnaire that was undertaken prior
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15 344 to the survey.
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20 346 *Comparison with previous work*

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23 347 In relation to drinking patterns, the results of this study suggest that Ireland has a high level
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25 348 of RSOD when compared to other countries⁴. The prevalence of alcohol dependence in this
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27 349 study was also high when compared to a study of alcohol dependence in European countries,
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30 350 although it should be noted that a number of different instruments were used to measure
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32 351 dependence in the European report.¹⁹
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37 353 The available evidence suggests that knowledge on standard drinks and drinking guidelines
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39 354 both in Ireland and internationally is limited, which may help explain why so few respondents
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42 355 correctly identified their pattern of drinking. Our findings regarding awareness of hazardous
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44 356 and harmful drinking are similar to a recent study in Australia, which reported that 68% of
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47 357 Australian drinkers who consume 11 or more standard drinks on a 'typical occasion' consider
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49 358 themselves a 'responsible drinker'.²⁰ A Swedish study reported low levels of knowledge of
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52 359 standard drink and hazardous drinking concepts among hazardous drinkers.²¹ A review of the
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54 360 literature on standard drinks for the European Joint Action on Alcohol found little
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57 361 understanding of what the term 'standard drink' actually means and that drinkers are not
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59 362 able to define standard drinks accurately.²² A 2012 Irish survey demonstrated that while 58%

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3 363 had heard of the term 'standard drink', just 39% knew how many standard drinks are in a pint
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6 364 of lager and 33% knew how many standard drinks are in a single measure of spirits, which are
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8 365 the typical serving sizes of lager and spirits in Ireland.²³ In the UK, knowledge of the previous
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10 366 drinking guidelines was poor, in spite of them having been in place for 20 years. In 2012, only
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13 367 about one-quarter of people were able to provide a correct estimate of how many units it
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15 368 was recommended their gender should not exceed in a day, which corresponded to a lower
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18 369 level of awareness than in 2009. This suggests that previous efforts to raise awareness of
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20 370 recommended drinking limits have not had lasting effect.²⁴ In Australia 53.5% correctly
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23 371 identified the guideline threshold for women and 20.3% did so for men.²⁵

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27 373 Knowledge on drinking guidelines in Ireland is also poor. In 2012, just 10% of men and 10% of
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30 374 women knew the gender-specific low-risk limits for alcohol consumption.²³ Ireland's
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32 375 guidelines were last reviewed in 2009.²⁶ The current guidelines recommend that men
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35 376 consume no more than 17 standard drinks and women no more than 11 standard drinks
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37 377 spread over the course of a week, with at least two alcohol free days. No guidance is given in
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40 378 relation to daily low-risk limits. These results suggest that further work on educating the Irish
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42 379 public on low-risk drinking limits is required. Given the high prevalence of frequent RSOD in
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45 380 Ireland it may also be appropriate to introduce low-risk daily limits. Drinkers in Ireland tend
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47 381 to consume alcohol relatively infrequently but, on the occasions that they do, they are likely
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50 382 to engage in RSOD. In order for individuals to monitor and be aware of their alcohol
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52 383 consumption, knowledge on the standard drink concept and low-risk drinking guidelines is
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55 384 required. It is unrealistic to expect people to stay within low-risk limits and to be able to
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57 385 accurately assess their own hazardous or harmful drinking in the absence of knowledge on
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59 386 what actually constitutes hazardous or harmful drinking.

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6 388 *Policy implications*

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8 389 Public health messaging can be utilised to provide health guidance regarding alcohol use to
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10 390 the general public. A systematic review on the effectiveness of mass media public health
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12 391 campaigns to reduce alcohol consumption and related harms found evidence that such
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14 392 campaigns can be recalled by individuals and can achieve improvements in knowledge about
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16 393 alcohol. There was no evidence that campaigns led to decreased alcohol consumption but the
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18 394 authors concluded that mass media can yield sustained knowledge, which may lay the
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20 395 groundwork for reductions in consumption that are achieved using other public health
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22 396 measures.²⁷ In Denmark, a repeated annual campaign from 1990 to 2000 increased
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24 397 awareness of low-risk drinking guidelines in all subsets of the population throughout the
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26 398 period.²⁸ Hazardous drinkers were more knowledgeable about the guidelines than low-risk
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28 399 drinkers, which shows that this important target group can be reached. There had been
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30 400 limited public health messaging in Ireland on low-risk drinking prior to 2017, when an alcohol
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32 401 campaign 'Ask About Alcohol' was commenced to provide clear and authoritative information
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34 402 on alcohol to the public across a number of media platforms. The website for this campaign
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36 403 is the first one dedicated to dealing with alcohol to be created by a State body in Ireland. It
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38 404 provides advice on low-risk drinking limits and contains a drinks calculator so the public can
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40 405 understand exactly how much they are drinking and whether it is within low-risk limits.
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52 407 This study demonstrates that further initiatives to reduce overall consumption and hazardous
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54 408 and harmful drinking patterns and raise awareness around drinking patterns are required.
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56 409 Based on the existing systematic review evidence on mass media campaigns,²⁷ simply having
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58 410 a public messaging campaign around hazardous and harmful drinking is insufficient to reduce
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3 411 alcohol consumption and problematic patterns of drinking in an alcogenic culture such as
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6 412 Ireland, where pro-alcohol social norms and alcohol marketing and sponsorship are pervasive.
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8 413 Older people and those with lower educational attainment were less likely to be aware of
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10 414 their hazardous or harmful drinking and efforts should be made to target this group in relation
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13 415 to raising awareness around alcohol use. Our results also suggest that there is a cohort of
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15 416 younger, well-educated drinkers in Ireland who also engage in other potentially risky
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17 417 behaviours and that these subjects are already aware of their hazardous or harmful drinking.
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19 418 Consequently, it is unlikely that public health messaging alone will be sufficient to result in
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21 419 behaviour change for this group in relation to their alcohol use. In 2018, following a
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23 420 protracted process, the Public Health (Alcohol) Act was signed into law. This is the first time
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25 421 that Ireland's harmful use of alcohol will be addressed coherently in public health legislation.
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27 422 The main provisions of the Act include the introduction of a minimum unit price for alcohol,
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29 423 restrictions on the advertising and sponsorship of alcohol products, the structural separation
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31 424 of alcohol from other non-alcohol products in small shops, convenience stores and
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33 425 supermarkets, and labelling of all alcohol products to provide consumers with information on
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35 426 the number of grams of alcohol per container, calorific content, and health warnings. These
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37 427 measures will be enacted over the coming years with the aim of reducing alcohol
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39 428 consumption in Ireland. However, it is important that these initiatives are accompanied by
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41 429 public health messaging. If a comprehensive and sustained public health messaging campaign
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43 430 is implemented alongside the provisions in the Public Health Alcohol Act, the likelihood of
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45 431 both raising awareness and achieving meaningful reductions in alcohol consumption and
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47 432 problematic drinking patterns will be increased. It is also imperative that evaluations on the
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49 433 effectiveness of the legislative measures and the public messaging campaign are undertaken
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51 434 regularly to assess their impacts.
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436 **Conclusions**

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

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

	All drinkers	Low-risk drinkers	Regular RSOD drinker	Dependent drinkers	
Weighted count=5144		N (%)	N (%)	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).

442 **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

444 **Box 2: Self-perception of own drinking**

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4 446 Light/moderate – those who selected one of these statements: *'I am a light*
5 447 *drinker'* or *'I am a moderate drinker'*
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9 449 Light/moderate and sometimes binge drink – those who selected one of these
10 statements: *'I am a light drinker and sometimes I binge drink'* or *'I am a*
11 450 *moderate drinker and sometimes I binge drink'*
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13 451 Heavy – those who selected one of these statements: *'I am a heavy drinker'*
14 or *'I am a heavy drinker and sometimes I binge drink'*
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48 463 **Declarations**

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51 464 Ethics approval and consent to participate: Ethical approval for the 2014/15 Drug

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53 465 Prevalence Survey was granted by the Royal College of Physicians Ireland (Ref: RECSAF 21).
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56 466 Consent for publication: Not applicable
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3 467 Availability of data and material: The datasets used and/or analysed during the current
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6 468 study are available from the corresponding author on reasonable request.
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9 469 Competing interests: None
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11 470 Funding: Funding was provided by the Department of Health, Ireland
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14 471 Authors' contributions: DM designed the study, analysed the data, and drafted the
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16
17 472 manuscript. SM provided statistical support and helped interpret the data. COD undertook a
18
19 473 review of the literature and provided assistance with data analysis. JL was involved in the
20
21 474 design and conception of the study. BG supervised the study. All authors reviewed and
22
23
24 475 helped to revise successive drafts and approved the final version of the manuscript.
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27 476 Acknowledgements: None
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For peer review only

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.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		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	
1			
2	Data sources /	#8	For each variable of interest give sources of data and details of methods of assessment
3	measurement		(measurement). Describe comparability of assessment methods if there is more than one group.
4			Give information separately for for exposed and unexposed groups if applicable.
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8	Bias	#9	Describe any efforts to address potential sources of bias
9			n/a
10	Study size	#10	Explain how the study size was arrived at
11			5
12	Quantitative	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which
13	variables		groupings were chosen, and why
14			9
15			
16	Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding
17			9
18	Statistical methods	#12b	Describe any methods used to examine subgroups and interactions
19			9
20	Statistical methods	#12c	Explain how missing data were addressed
21			9
22	Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy
23			9
24	Statistical methods	#12e	Describe any sensitivity analyses
25			n/a
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28	Results		
29			
30	Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible,
31			examined for eligibility, confirmed eligible, included in the study, completing follow-up, and
32			analysed. Give information separately for for exposed and unexposed groups if applicable.
33			10
34	Participants	#13b	Give reasons for non-participation at each stage
35			10
36	Participants	#13c	Consider use of a flow diagram
37			n/a
38			
39	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on
40			exposures and potential confounders. Give information separately for exposed and unexposed
41			groups if applicable.
42			10
43	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest
44			Table 1
45	Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for
46			exposed and unexposed groups if applicable.
47			10-12
48	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision
49			(eg, 95% confidence interval). Make clear which confounders were adjusted for and why they
50			were included
51			11-12
52	Main results	#16b	Report category boundaries when continuous variables were categorized
53			10-12
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1	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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4	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	10-12
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8	Discussion			
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11	Key results	#18	Summarise key results with reference to study objectives	12
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13	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
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17	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	14
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21	Generalisability	#21	Discuss the generalisability (external validity) of the study results	13, 15
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24	Other			
25	Information			
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27	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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