Risk of alcohol and other health-related consequences with increased alcohol consumption and early onset of drinking among adolescents presenting at emergency departments

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Abstract

Background

Globally, alcohol use is the leading cause of ill-health and life years lost in adolescents, although its clinical impact is often overlooked as most research is based in schools.

Aim

To examine the association between alcohol consumption and age of onset with health and social consequences among adolescents presenting to emergency departments (ED)**.**

Methods

Consecutive attenders (n=5576) to ten EDs aged 10-17 were included in this research. Information was collected on general health and functioning, quality of life, alcohol use and alcohol-related health and social consequences.

Results

Greater alcohol consumption and age of onset of alcohol consumption before age 15 were associated with tobacco use, lower quality of life, harmful alcohol use, general social functioning and alcohol related health and social consequences ($p<0.05$).

Conclusion

Associations between alcohol consumption and earlier onset of drinking with poorer health and social functioning were observed. The ED may offer an opportunity for alcohol screening and brief intervention in adolescents.

INTRODUCTION

Adolescence is a critical period of development during which, the initiation and continuing use of alcohol may have detrimental consequences for the young person (1). Several adverse health and social consequences of alcohol use in young people are widely reported in research and health policy including; an increase in depressive feelings, increased risk taking in sexual practices, lower educational performance, difficulties in maintaining relationships with peers and friends and an increased vulnerability to becoming a victim of crime (2). The European School Survey Project on Alcohol and Other Drugs (ESPAD) in 40 countries reported at least 70% of students aged 15-16 years having had alcohol in their lifetime (3). Worldwide, alcohol is the largest risk factor for incident Disability-Adjusted Life-Years (DALYS: 7%) in adolescents aged 10-24 (4). Although it is difficult to establish causality of alcohol use in adolescents and social and behavioural problems several studies have shown earlier consumption is associated with alcohol-related problems in later life (5-11). A recent review recommended further research to establish the value of later onset in drinking when establishing drinking guidelines in adolescence (12).

Previous research examining the association between alcohol use and health and social consequences in adolescents has generally taken place in the context of the school, but the accuracy of this picture may be incomplete owing to the absence of those most vulnerable, who may be missed by school surveys through truancy or sickness at the time of the survey (13). The current research aims to examine the association between alcohol consumption and age of onset of alcohol consumption with health and social consequences among adolescents presenting at hospital emergency departments (ED).

METHODS

Participants

This research forms part of the SIPS Junior research programme (14). Participants were aged between their 10th and 18th birthdays attending one of 10 participating Emergency Departments (ED) across

England: North East, Yorkshire and Humber, and London. To be eligible for inclusion in the research the participant had to be alert and orientated and able to speak sufficient English to complete the research assessments. Participants were not eligible for inclusion if they had a severe injury, were suffering from a serious mental health problem, grossly intoxicated or if they, their parent or guardian were unable or unwilling to provide informed consent to take part. The current study included the data for those participants reporting that they had consumed any alcohol in their lifetime. The study received ethical approval from National Health Service Research Ethics Committee London – Camden and Islington 12/LO/0799, ISRCTN: 45300218.

Procedure

Consecutive ED attenders, between the hours of 8am and midnight every day, meeting the study criteria were approached by a researcher after clearance to do so had been granted by the ED staff. Researchers approached potential participants following triage, while patients were waiting for treatment. Hence, patient care was not disrupted by the study procedure.

Before giving consent for participation, potential participants, and their parents or guardians where applicable, were given a study information sheet and the opportunity to ask any questions. All potential participants (and their parents or guardian) were informed that the information disclosed to researchers about the use of alcohol would be kept confidential and not passed to the parent or guardian or ED staff without prior consent of the participant. For those participants under the age of 16 and unaccompanied by a parent or guardian, Gillick competencies was assessed by a member of ED staff when taking informed consent for participation (15).

After giving informed consent, the participant was taken to a private area in the ED to complete the research interview independently, with the researcher available for support if necessary. The study data were anonymous and collected via an electronic tablet device, with the exception of the timeline follow-back questionnaires, which were manually completed with the researcher. Once the interview

was complete, participants returned to the care of the ED staff or their parent or guardian. A £5 gift voucher was given to all participants to thank them for their time. All young people participating in the study were also given age-appropriate material containing information on alcohol and local services or help lines providing further support.

M**easures**

Online supplementary figure 1 illustrates the flow of research questions. Demographics including age, gender and ethnicity were collected for all participants as was information on general health behaviours and lifestyle including tobacco smoking. Health-related quality of life was assessed using the Kidscreen (16), a 10-item generic health-related quality of life measure with established validity and reliability in this population. Behavioural and emotional functioning was measured using the Strengths and Difficulties Questionnaire (17, 18) (SDQ). In addition we asked several questions related to age appropriate service use including questions on; previous use of health and social services, school attendance, and contact with criminal justice.

In participants who reported any alcohol consumption, the age of first consumption was recorded and further questions on whether they had used alcohol in the past 3 months and past 24 hours were asked. In addition, all participants who had ever drunk alcohol were asked question 19 ("experienced alcohol intoxication in their lifetime?") and question 21 ("personal experience of alcohol?") of the European School Survey Project on Alcohol and Other Drugs (3) (ESPAD). Further questions were included to assess the feasibility of conducting a future alcohol intervention study (14) including whether the participant would like further information or advice about alcohol, and whether they would be willing to participate in an intervention and follow up study if offered.

Those participants who indicated that they had consumed alcohol that was 'more than a sip' in the past 3 months were asked additional alcohol specific questions. Hazardous alcohol use and alcohol abuse and dependence, were assessed using the Alcohol Use Disorders Identification Test (19) (AUDIT)

and the alcohol section of the Mini International Neuropsychiatric Interview for Children and Adolescents (20) (MINIKID). Quantity of alcohol consumed in the past 90 days was derived from the Timeline Follow-Back Form 90 (21) (TLFB) and converted to standard units where one unit was the equivalent of 8g of pure ethanol. The AUDIT has been validated in adolescent populations in the ED in the United States (22, 23) and a cut-off of 3 was used in line with previous research in adolescents (23). The TLFB has been validated for use in this population (25-27). Consequences of alcohol consumption were assessed by ESPAD question 22 "Because of your own alcohol use, how often during the last 12 months have you experienced the following?" (3; online supplementary table 1).

Statistical analyses

Logistic regression was used to examine the relationship between demographics (age, gender and ethnicity) and measures of health and social functioning as predicted variables and whether a participant had consumed alcohol in the previous 3 months as predictor a variable. Logistic, linear or multinomial regression analysis was undertaken to explore the relationship between alcohol consumption in the previous 90 days and psychological and social problems. Age, gender and ethnicity were included in the analysis with total alcohol consumed (in standard UK units) in the previous 90 days as the predictor variable. Alcohol consumption was transformed taking the natural logarithms to ameliorate its non-normal distribution. Alcohol related consequences (measured using ESPAD), tobacco use, MINIKID diagnosis, Strengths and Difficulties Questionnaire domains and quality of life (measured using the Kidscreen) were included as predicted variables. There is a reciprocal relationship between alcohol and behavioural and emotional functioning, whereby alcohol may result in problems with functioning or problems with functioning may lead to alcohol use. This relationship is difficult to disentangle. To demonstrate this linear regression analyses were performed with alcohol consumption as the predicted variable and SDQ, Kidscreen and tobacco use as individual predictors taking into consideration age, gender and ethnicity. The results of these analyses are presented in online supplementary table 2.

Regression analysis was also used to explore the relationship between age of first drink of alcohol and psychological and social problems in participants aged 16 or 17. Current UK drinking guidelines recommend an alcohol-free childhood; and that young people choosing to consume alcohol should not do so until age 15, nor exceeding adult daily unit recommendations, nor drink more than once a week (28). To reflect these guidelines, only those aged 16 or 17 were included in the analysis of time of onset of alcohol consumption. Consumption in the previous 90 days (transformed by taking the logarithms), gender and ethnicity were covariates in the analysis with age of first alcohol consumption (two categories, aged less than 15 and aged 15+) as the predictor variable. Those variables that showed a relationship that was significant at the 20% level were included as predicted variables.

RESULTS

A total of 5576 participants consented to take part in the research. The mean age of those who took part in the research was 13 years old (SD 2.07), proportions of males and females were roughly even but a greater proportion of participants were white compared with other ethnicities (table 1).

< Table 1 about here >

A total of 1374 (24.6% of the whole sample) reported drinking more than a sip of alcohol in the previous 3 months. The average age of first alcoholic drink was 12.9 (standard deviation = 2.19), ranging from five to 17 years of age (17 was the upper limit for inclusion in this study). Alcohol consumption in the previous3 months was associated with older age, being female, white and to have smoked tobacco. In addition, those who had consumed alcohol within the previous 3 months were more likely to report a lower quality of life and to have peer and social problems. Online supplementary table 1 presents the descriptive data on demographics, general social functioning and quality of life for those who had consumed alcohol in the previous 3 months.

The results of the regression analysis found that total alcohol consumed in the previous 90 day period was associated with tobacco use, lower quality of life, harmful alcohol use, poorer general social

functioning (conduct and hyperactivity) and ESPAD questions on health and social problems as a consequence of alcohol consumption (Table 2).

< table 2 about here >

Further regression analysis was conducted to investigate the association between age of first alcohol consumption and psychological and social problems. Only participants aged 16 or 17 who had consumed alcohol in the past 3 months were included in this analysis (10% of the total study sample, 44% of those who had consumed alcohol in the past 3 months). Variables that did not show an association with alcohol use were excluded from the analysis. Online supplementary table 3 gives an overview of the subsample.

Table 3 presents the results of the regression analysis. Consumption of alcohol before the age of 15 was associated with an increased risk of a number of health and social problems. These included a greater risk of smoking tobacco and harmful alcohol use as indicated by the AUDIT and Minikids. Consumption of alcohol before the age of 15 was also associated with a greater risk of experiencing conduct and hyperactivity problems and more alcohol related social problems including, having an accident, problems with a parent, school problems as well as experiencing problems with the police.

< table 3 about here >

DISCUSSION

A high prevalence of alcohol use disorders was identified among adolescents presenting at emergency departments in England who had consumed alcohol in the last 3 months, with 47% of drinkers screening positive for harmful alcohol use (three or more on the AUDIT) and 15% screening positive for alcohol abuse or dependence (using MINIKID). The prevalence of alcohol use disorders and diagnosis of alcohol abuse or dependence was considerably higher among participants who started drinking before the age of 15, with over three quarters of those who started drinking before 15 scoring 3 or more on the AUDIT and almost 1 in 3 meeting the criteria for alcohol abuse or dependence. Adolescents presenting at EDs in England may therefore be at a high-risk of alcohol use disorders and

alcohol-related harm. Participants in this study were more likely to have reported experiencing an accident or injury, been a victim of robbery or theft, or been hospitalised or admitted to an emergency room as a result of their own alcohol consumption compared with the findings of the 2011 ESPAD survey of school pupils in Europe. However, parent problems, peer problems, school problems and involvement with the police were also less prevalent among our participants compared with the findings of the ESPAD 2011 survey (3).

Regression analysis (Table 3) showed that higher alcohol consumption in the last 90 days (from the TLFB) was associated with increased odds of all the negative consequences of alcohol consumption studied (from ESPAD). Heavier drinking was also associated with smoking, worse quality of life, and exhibiting symptomology of conduct and hyperactivity problems on the SDQ, as well as alcohol use disorders and alcohol abuse. Earlier onset of drinking (under 15) was associated with increased odds of four of the of the 10 ESPAD alcohol consequences studied, as well as smoking, worse quality of life, and exhibiting symptomology of conduct and hyperactivity problems on the SDQ, as well as alcohol use disorders and alcohol abuse (Table 3). This study clearly shows an association between earlier alcohol consumption and harm in adolescents but it remains to be established whether these persist into adulthood (9). The relationship between alcohol consumption and emotional and behavioural functioning is difficult to disentangle with causality not always possible to establish, with little consensus being reached in the literature (10-11). To further investigate this a two sets of linear regressions were conducted with alcohol consumption as the predicted and the predictor variable. Similar results were found for both analyses. A large birth cohort study tested the hypothesis of whether substance use (alcohol or illicit drugs) is a causal factor of poor outcomes in adulthood or whether adolescents with pre-existing behavioural problems (conduct disorder) are more likely to use alcohol or drugs and experience poor outcomes as adults (10). It was found that around 50% of the adolescents in the study who were exposed to drugs or alcohol prior to the age of 15 had no history of conduct disorder but were still at an increased risk of behavioural and social problems in adulthood. Worldwide, alcohol has been identified as one of the main risk factors for incident DALYs in those aged

10-24 (4). While the results of the current study do not establish causality, effective interventions to reduce alcohol consumption in this population could potentially mitigate the negative consequences related to alcohol that are experienced from a young age in this group.

This is the first study to investigate the prevalence of alcohol consumption and the relationship with emotional and behavioural problems and alcohol related harms in adolescents presenting to the emergency department. The strengths of this study include the large sample size, the wide age range of non-alcohol treatment-seeking adolescents studied, and the broad spread of study across 10 emergency departments across England. Fieldwork took place over several months every day of the week and from 8 am to midnight, so our findings are a good indication of the prevalence of alcohol use disorders in this population. Most of the evidence on alcohol screening and brief intervention in young people comes from a school setting, or in older adolescents but as this study in the emergency department has identified a high prevalence of alcohol use disorders in this group we suggest this setting is a relevant one for research on alcohol and young people. The questionnaire asked participants about a comprehensive range of alcohol measures (TLFB, BSQF, AUDIT, MINIKIDS, as well as the ESPAD questions on intoxication), which will be explored fully in a separate paper. Use of technology to collect data was successful in this study, and this also shows promise as a tool to deliver interventions (29).

This study does have some limitations. Many of the measures used (such as TLFB), were initially developed for adults, although some have also been validated for use in this population (for example the TLFB) (20, 25-27). Some of the questions about alcohol consequences (e.g. ESPAD) are usually asked about the last 12 months, however in the present study these questions were only asked of participants who drank alcohol in the last three months. Some of the outcomes measured may have been experienced among less recent drinkers (or non-drinkers), and these may not have been captured, especially as at a young age drinking patterns are often infrequent or irregular (30). This suggests that questions routinely used to measure drinking in young people may not be sufficiently

detailed. Finally, for some of the less common outcomes studied, there was a small sample size in some subgroups and resulting odds ratios should be interpreted with caution (for example the OR of 13.5 for early onset and involvement with the police seen in Table 5).

It is possible that the self-completion nature of the survey and the study setting may have biased our estimates. Focus groups were held with members of a national youth organisation that showed the anonymous electronic tablet device self-completion questionnaire was perceived as highly confidential and secure, and therefore participants may have been willing to disclose information that would typically have been withheld in a face-to-face survey or paper self-completion questionnaire. Also, as the participants were patients in the emergency department, it is very possible that they had recently experienced a traumatic or painful event, which may have biased their responses (particularly to the SDQ and ESPAD items) negatively, additionally participants may have exaggerated or under-reported alcohol consumption due to social desirability bias. However, we believe these results are an accurate representation of adolescents attending emergency departments.

Current UK drinking guidelines recommend an alcohol-free childhood and that young people choosing to consume alcohol should not do so until age 15 or older, and should not exceeding adult daily unit recommendations and if they drink, should not drink more than one occasion per week (28). Our study supports this but also shows a high prevalence (51%) of hazardous drinking among participants who started drinking at age 15 or older (Table 4), therefore the risks of drinking are not restricted to those with an early onset. Future studies should explore how the risks associated with drinking alcohol vary by age of onset in more detail.

A high prevalence of alcohol use disorders among adolescents presenting at EDs in England was identified in this study. Associations between alcohol consumption and earlier onset of drinking and negative consequences of drinking (as measured by the ESPAD questions) and poorer health and functioning were also observed. This study found emergency department waiting rooms had a ‘captive audience’ of willing research participants, and this context may also represent a teachable moment to

change young people's behaviour using either face-to-face or electronic interventions (30-31). The emergency department also has a high level of staff expertise who are well placed to initiate safeguarding procedures where required and who provide a good point of onward referral to specialist services. The possibility of conducting alcohol screening and brief intervention among adolescents presenting at the emergency department should be investigated, and the effectiveness of alcohol screening and brief intervention in this population and setting established (14).

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Conflicts of Interest

JS is a researcher and clinician and has worked with a range of types of treatment and rehabilitation service-providers. He has also worked with pharmaceutical companies to seek to identify new or improved treatments, and also with a range of governmental and non-governmental organisations, from whom funding and support have been received by him and his employer (King's College London):

none of these relate to the topic of report in this paper. A fuller account of JS's interests is on his web-page of the Addictions Department at

http://www.kcl.ac.uk/ioppn/depts/addictions/people/hod.aspx

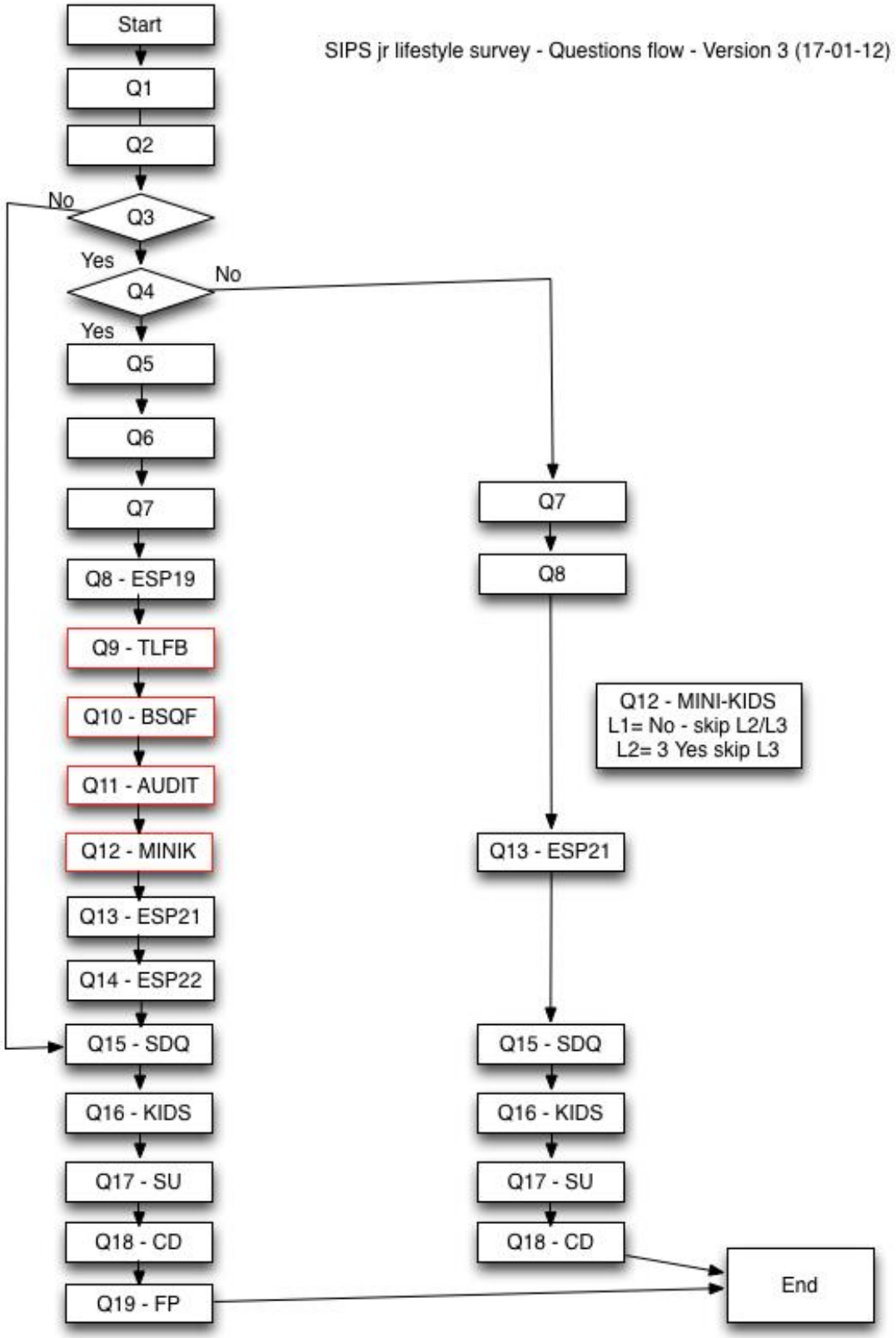
Online Supplementary Figure 1: flow of research questions

1. Demographics
2. Health and Lifestyle questionnaire
3. Filter question 1 - Have you ever drunk alcohol, do not include just a sip of somebody else's drink?
4. Filter question 2 - Have you ever drunk alcohol, do not include just a sip of somebody else's drink, in the past **3 months**?
5. Alcohol consumed in past 24 hours
6. Alcohol consumed prior to attendance
7. Age of first consumption
8. ESPADQ19 (alcohol intoxication)
9. TLFB90[1,3]
10. BSQF[1,3]
11. AUDIT[2,3]
12. MINIKIDS Alcohol[2,3]
13. ESPAD Q21
14. ESPAD Q22
15. SDQ
16. KIDSCREEN
17. Service Utilisation
18. Cognitive Debrief
19. Future participation details

[1] The order of presentation of quantity-frequency measures (TLFB and BSQF) were at random stratified by age-group.

[2] The order of presentation of diagnostic measures (AUDIT and MINIKIDS) were allocated at random stratified by age-group.

[3] The order of presentation of quantity-frequency measures and diagnostic measures were allocated at random stratified by age-group.


SIPS jr lifestyle survey - Questions flow - Version 3 (17-01-12)
Start
Q1
Q2
Q3
No
Yes
Q4
No
Yes
Q5
Q6
Q7
Q8 - ESP19
Q9 - TLFB
Q10 - BSQF
Q11 - AUDIT
Q12 - MINIK
Q13 - ESP21
Q14 - ESP22
Q15 - SDQ
Q16 - KIDS
Q17 - SU
Q18 - CD
Q19 - FP
Q7
Q8
Q12 - MINI-KIDS
L1= No - skip L2/L3
L2= 3 Yes skip L3
Q13 - ESP21
Q15 - SDQ
Q16 - KIDS
Q17 - SU
Q18 - CD
End

Online Supplementary Table 1: Alcohol consumption and consequences among those who had consumed alcohol in the previous 3 months (n=1374)

	Mean	SD
TLFB90, mean (SD)	11.94	3.86
	N	%
Total AUDIT		
Score less than 3	674	52.8
Score equal or greater than 3	602	47.2
MINIKID, N (%)		
No diagnosis	1120	85.2
Diagnosis	194	14.8
ESPAD Physical fight, N (%)		
No	1181	90.5
Yes	124	9.5
ESPAD Accident/Injury, N (%)[6]		
No	1126	86.3
Yes	178	12.7
ESPAD Parent problem, N (%)		
No	1213	93.0
Yes	91	7.0
ESPAD Peer problems, N (%)		
No	1167	89.5
Yes	137	10.5
ESPAD School problems, N (%)		
No	1224	93.8
Yes	81	6.2
ESPAD Robbery, N (%)		
No	1189	91.3
Yes	114	8.7
ESPAD Police, N (%)		
No	1229	94.1
Yes	77	5.9
ESPAD emergency admission, N (%)		
No	1208	92.7
Yes	95	7.3
ESPAD no condom, N (%)		
No	1173	90.2
Yes	128	9.8
ESPAD regretted sex, N (%)		
No	1201	92.3
Yes	100	7.7

Online Supplementary Table 2: Linear regression for the association between social and behavioural problems and alcohol consumption to demonstrate the bi-directional nature of causality.

Variable	β	P	95% confidence interval
Tobacco[1]			
No	0		
Yes	0.927	**<0.001**	0.770 – 1.084
SDQ emotion			
Normal	0		
Borderline	-0.029	0.860	-0.535 – 0.294
Abnormal	0.084	0.515	-0.169 – 0.338
SDQ conduct			
Normal	0		
Borderline	0.325	**0.006**	0.092 – 0.558
Abnormal	0.383	**0.001**	0.154 – 0.612
SDQ hyperactivity[2]			
Normal	0		
Borderline	0.237	0.068	-0.018 – 0.491
Abnormal	0.278	**0.006**	0.080 – 0.476
SDQ Peer			
Normal	0		
Borderline	0.002	0.984	-0.207 – 0.211
Abnormal	0.234	0.204	-0.127 – 0.594
SDQ prosocial[2]			
Normal	0		
Borderline	0.127	0.325	-0.126 – 0.379
Abnormal	0.113	0.391	-0.145 – 0.370
Kidscreen QOL[3]	-0.027	**<0.001**	-0.040 - -0.014

Table 1: overview of study sample and regression analysis to explore the relationship between demographics and measures of general health and social functioning and the consumption of alcohol in the previous 3 months

	Whole sample	No alcohol in the past 3 months	Consumed alcohol in the past 3 months	Odds of having consumed alcohol in the past 3 months
Age, mean (SD)	13.28 (2.074)	12.65 (1.850)	15.12 (1.511)	OR = 2.147, p<0.001, 95% CI=2.050-2.248
Gender, N (%)				
Male	2869 (53.8)	2183 (55.1)	686 (49.9)	
Female	2465 (46.2)	1777 (44.9)	688 (50.1)	OR = 1.232, p=0.001, 95% CI=1.090-1.393
Ethnicity, N (%)				
Other	1396 (27.4)	1215 (32.1)	181 (13.8)	
White	3699 (72.6)	2565 (67.9)	1134 (86.2)	OR = 2.968, p<0.001, 95% CI = 2.501-3.521
Tobacco, N (%)				
No	4846 (91.1)	3843 (97.36)	1003 (73.2)	
Yes	476 (8.9)	108 (2.7)	368 (26.8)	OR = 13.056, p<0.001, 95% CI = 10.420-16.357
SDQ emotion scale, N (%)				
Normal	4556 (86.9)	3442 (87.4)	1114 (85.6)	
Borderline	284 (5.4)	211 (5.4)	73 (5.6)	OR=1.069, p=0.634, 95% CI=0.812-1.407
Abnormal	400 (7.6)	285 (7.2)	115 (8.8)	OR=1.247, p=0.057, 95% CI=0.994-1.56
SDQ Conduct scale, N (%)				
Normal	1404 (78.6)	3082 (78.7)	1022 (78.3)	
Borderline	519 (9.9)	382 (9.8)	137 (10.5)	OR=1.082, p=0.459, 95% CI=0.879-1.331
Abnormal	600 (11.5)	453 (11.6)	147 (11.3)	OR=0.979, p=0.831, 95% CI=0.802-1.194
SDQ Hyperactivity scale, N (%)				
Normal	3919 (74.9)	2941 (74.9)	978 (75.2)	
Borderline	495 (9.5)	380 (9.7)	115 (8.8)	OR=0.910, p=0.403, 95% CI = 0.730-1.135

Abnormal	815 (15.6)	608 (15.5)	207 (15.9)	OR=1.024, p=0.790, 95% CI= 0.861-1.218
SDQ Peer scale, N (%)				
Normal	4471 (85.5)	3393 (86.4)	1078 (82.7)	
Borderline	584 (11.2)	413 (10.5)	171 (13.1)	OR=0.303, p=0.007, 95% CI=1.077-1.577
Abnormal	175 (3.3)	121 (3.1)	54 (4.1)	OR=1.405, p=0.042, 95% CI=1.012-1.950
SDQ Prosocial scale, N (%)				
Normal	4704 (89.6)	3639 (92.3)	1065 (81.5)	
Borderline	328 (6.2)	204 (5.2)	124 (9.5)	OR=2.077, p<0.001, 95% CI=1.6452.623
Abnormal	218 (4.2)	101 (2.6)	117 (9.0)	OR=3.958, p<0.001, 95% CI=3.007-5.210
Quality of life, mean (SD)	42.92 (5.32)	43.58 (5.03)	40.92 (5.66)	OR=0.906, p<0.001, 95% CI=0.894-0.918

NB: OR = Odds Ratio, CI = Confidence Interval

Table 2: Regression analysis for the association between alcohol consumption (TLFB) and psychological and social problems

Variable	β	OR	p	95% confidence interval
Tobacco[1]				
No	0	1.0		
Yes	0.640	1.897	**<0.001**	1.670 – 2.155
SDQ emotion[2]				
Normal	0	1.0		
Borderline	-0.015	0.893	0.985	0.787 – 1.231
Abnormal	0.057	1.059	0.523	0.889 – 1.261
SDQ conduct[2]				
Normal	0	1.0		
Borderline	0.235	1.265	**0.005**	1.074 – 1.490
Abnormal	0.270	1.309	**0.001**	1.115 – 1.538
SDQ hyperactivity[2]				
Normal	0	1.0		
Borderline	0.167	1.182	0.065	0.990 – 1.412
Abnormal	0.193	1.212	**0.006**	1.057 – 1.391
SDQ peer[2]				
Normal	0	1.0		
Borderline	0.003	1.003	0.971	0.866 – 1.162
Abnormal	0.158	1.171	0.213	0.913 – 1.501
SDQ prosocial[2]				
Normal	0	1.0		
Borderline	0.087	1.091	0.332	0.915 – 1.300
Abnormal	0.076	1.079	0.404	.902 – 1.291
Quality of life[3]	-0.537		**<0.001**	-0.802 - -0.271
Alcohol measures				
AUDIT[1]				
Score less than 3	0	1.0		
Score equal or greater than 3	1.296	3.656	**<0.001**	3.065 – 4.360
Minikid[1]				
No diagnosis	0	1.0		
Diagnosis	1.049	2.855	**<0.001**	2.388 – 3.414
ESPAD physical fight[1]				
No	0	1.0		
Yes	0.880	2.410	**<0.001**	1.998 – 2.907
ESPAD Accident[1]				
No	0	1.0		
Yes	0.709	2.032	**<0.001**	1.737 – 2.378
ESPAD Parent problem[1]				
No	0	1.0		
Yes	0.924	2.519	**<0.001**	2.039 – 3.112

ESPAD Peer problem[1]				
No	0	1.0		
Yes	0.633	1.883	**<0.001**	1.601 – 2.214
ESPAD School problem[1]				
No	0			
Yes	0.625	1.869	**<0.001**	1.520 – 2.298
ESPAD Victim of Robbery[1]				
No	0	1.0		
Yes	0.576	1.778	**<0.001**	1.493 – 2.118
ESPAD Police[1]				
No	0	1.0		
Yes	0.850	2.340	**<0.001**	1.877 – 2.918
ESPAD Emergency Admission[1]				
No	0	1.0		
Yes	0.765	2.150	**<0.001**	1.765 – 2.618
ESPAD No Condom[1]				
No	0	1.0		
Yes	0.787	2.197	**<0.001**	1.833 – 2.634
ESPAD Regretted Sex[1]				
No	0	1.0		
Yes	0.781	2.183	**<0.001**	1.803 – 2.644

NB: After adjusting for age, gender and ethnicity as covariates. [1] Logistic regression, [2]Multinomial regression, [3]Linear regression

Online Supplementary Table 3: Descriptive statistics and psychological and social problems by age of onset of alcohol use (n=609)

	Age of onset before age 15	Age of onset age 15+
Gender, N (%)		
Male	168 (47.3)	125 (49.2)
Female	187 (52.7)	129 (50.8)
Ethnicity, N (%)		
White	305 (88.4)	209 (85.0)
Other	40 (11.6)	37 (15.0)
Tobacco ever, N (%)		
No	174 (49.2)	198 (78.0)
Yes	180 (50.8)	56 (22.0)
SDQ Conduct scale, N (%)		
Normal	258 (75.9)	223 (92.1)
Borderline	41 (12.1)	12 (5.0)
Abnormal	41 (12.1)	7 (2.9)
SDQ Hyperactivity scale, N (%)		
Normal	245 (72.3)	206 (85.8)
Borderline	29 (8.6)	16 (6.7)
Abnormal	65 (19.2)	18 (7.5)
Quality of life, mean (SD)	39.81 (5.34)	41.50 (5.78)
TLFB90, mean (SD)	27.11 (3.86)	13.87 (3.22)
Total AUDIT, N (%)		
Score less than 3	77 (23.5)	116 (49.2)
Score equal or greater than 3	251 (76.5)	120 (50.8)
MINIKID, N (%)		
No diagnosis	247 (72.4)	221 (90.6)
Diagnosis	94 (27.6)	23 (9.4)
ESPAD Physical fight, N (%)		
No	287 (84.4)	229 (95.0)
Yes	53 (16.6)	12 (5.0)
ESPAD Accident/Injury, N (%)		
No	259 (76.2)	218 (90.5)
Yes	81 (23.8)	23 (9.5)
ESPAD Parent problem, N (%)		
No	306 (90.0)	235 (97.9)
Yes	34 (10.0)	5 (2.1)
ESPAD Peer problems, N (%)		
No	285 (83.8)	216 (90.0)
Yes	55 (16.2)	24 (10.0)
ESPAD School problems, N (%)		
No	307 (90.3)	235 (97.5)
Yes	33 (9.7)	6 (2.5)

ESPAD Victim or robbery, N (%)		
No	293 (86.7)	225 (93.4)
Yes	45 (13.3)	16 (6.6)
ESPAD Police, N (%)		
No	308 (90.6)	242 (99.6)
Yes	32 (9.4)	1 (0.4)
ESPAD emergency admission, N (%)		
No	296 (87.3)	233 (95.9)
Yes	43 (12.7)	10 (4.1)
ESPAD no condom, N (%)		
No	271 (79.9)	224 (92.2)
Yes	68 (20.1)	19 (7.8)
ESPAD regretted sex, N (%)		
No	288 (85.2)	229 (94.2)
Yes	50 (14.8)	14 (5.8)

Table 3: Regression analysis of whether age of alcohol onset was less than 15 on psychological and social problems – in respondents aged 16 and 17

Variable	β	OR	P	95% confidence interval
Tobacco[1]				
No	0	1.0		
Yes	1.039	2.827	**<0.001**	1.861 – 4.295
SDQ conduct[2]				
Normal	0	1.0		
Borderline	0.944	2.569	**0.014**	1.209 – 5.461
Abnormal	1.523	4.588	**0.001**	1.841 – 11.433
SDQ hyperactivity[2]				
Normal	0	1.0		
Borderline	0.359	1.431	0.322	0.704 – 2.910
Abnormal	0.977	2.657	**0.001**	1.462 – 4.830
Kidscreen QOL[3]	1.591		**0.003**	0.562 – 2.620
AUDIT[1]				
Score less than 3	0	1.0		
Score greater than 3	0.663	1.941	**0.005**	1.225 – 3.074
Minikid[1]				
No diagnosis	0	1.0		
Diagnosis	0.903	2.467	**0.002**	1.379 – 4.414
ESPAD physical fight[1]				
No	0	1.0		
Yes	0.683	1.979	0.073	0.938 - 4.174
ESPAD Accident[1]				
No	0	1.0		
Yes	0.591	1.807	**0.046**	1.010 – 3.232
ESPAD Parent[1]				
No	0	1.0		
Yes	1.500	4.483	**0.017**	1.303 – 15.426
ESPAD Peer Problem[1]				
No	0	1.0		
Yes	0.089	1.093	0.768	0.606 – 1.972
ESPAD School Problem[1]				
No	0	1.0		
Yes	1.332	3.789	**0.017**	1.266 – 11.344
ESPAD Victim of robbery[1]				
No	0	1.0		
Yes	0.280	1.324	0.434	0.655 – 2.673
ESPAD Police[1]				
No	0	1.0		

Yes	2.605	13.526	**0.012**	1.785 – 102.481
ESPAD Emergency Admission[1]				
No	0	1.0		
Yes	0.389	1.475	0.350	0.653 – 3.335
ESPAD No Condom[1]				
No	0	1.0		
Yes	0.550	1.733	**0.074**	0.949 – 3.166
ESPAD Regretted Sex[1]				
No	0	1.0		
Yes	0.434	1.543	0.210	0.783 – 3.043

NB: After adjusting for gender, ethnicity and alcohol consumption (TLFB) as covariates. [1]Logistic regression, [2]Multinomial regression, [3]Linear regression

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