Adolescent Predictors and Environmental Correlates of Young Adult Alcohol Use Problems

John W. Toumbourou,
Prevention Sciences, School of Psychology and Centre for Mental Health and Wellbeing Research, Deakin University

Tracy J. Evans-Whipp,
Centre for Adolescent Health, Murdoch Childrens Research Institute, Department of Paediatrics, The University of Melbourne

Rachel Smith,
Centre for Adolescent Health, Murdoch Childrens Research Institute, Department of Paediatrics, The University of Melbourne

Sheryl A. Hemphill,
School of Psychology, Australian Catholic University

Todd I. Herrenkohl, and
Social Development Research Group, School of Social Work, University of Washington

Richard F Catalano
Social Development Research Group, School of Social Work, University of Washington

Abstract

Aims—To examine: rates of young adult alcohol and drug use and alcohol problems; adolescent predictors of young adult alcohol problems; and correlations with young adult social, work, and recreational environments.

Design—Adolescents were longitudinally followed into young adulthood. Predictors were measured in grade 9 (av., age 15), and environmental correlates and outcomes in young adulthood (av., age 21).

Setting—Students recruited in Victoria, Australia in 2002, were resurveyed in 2010/11.

Participants—Analytic N = 2,309, 80% retention.

Measurements—Adolescent self-report predictors included past-month alcohol use. Young adults completed the Alcohol Use Disorders Identification Test (AUDIT) together with reports of environmental influences.

Findings—Comparisons to United States of America (U.S.) national school graduate samples revealed higher rates of alcohol, tobacco, and illicit drug use (other than cannabis) in Victoria. For

Correspondence should be addressed to: Prof John Toumbourou, School of Psychology, Deakin University, Geelong Waterfront Campus, Geelong, 3220. Ph. +61 3 5227 8278. john.toumbourou@deakin.edu.au.
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example rates of past month use at age 21–22 were: alcohol 69.3% U.S. vs 84.9% (95% Confidence Interval [CI]) 81.3 – 88.6% Victoria; illicit drugs (other than cannabis) 8.8% vs 12.7%, CI 9.7 – 15.7%. AUDIT alcohol problems (scored 8+) were identified for 41.2%, CI 38.8 – 43.6% of young adults in Victoria. The likelihood of young adult alcohol problems was higher for frequent adolescent alcohol users, and those exposed to environments characterised by high alcohol use and problems in young adulthood.

Conclusions—High rates of alcohol problems are evident in over two in five Australian young adults and these problems appear to be influenced both by earlier patterns of adolescent alcohol use and by young adult social work, and recreational environments.

Keywords

Longitudinal research; adolescence; young adulthood; risk factors; alcohol use; alcohol abuse; environmental influences

INTRODUCTION

Early adulthood is a time of high vulnerability for the emergence of alcohol use problems that represent the major preventable contributor to death and disability in this age period internationally [1, 2]. The current study examined rates of problematic drinking within a state sample of Australian young adults and explored adolescent predictors and concurrent environmental correlates.

Cross-national and developmental research offers opportunities to understand factors that influence young adult alcohol use. Cross-national and state-level studies show that rates of alcohol use are reduced by environmental factors (defined here to include policy and contextual influences) such as a higher price for alcohol, restricted alcohol availability, regulation and enforcement of alcohol marketing and sales environments, and an older legal age for purchase and use [3].

Developmental researchers have used longitudinal studies to compare the life-course aetiology of alcohol use behaviours in different cultural contexts. The International Youth Development Study (IYDS) is a longitudinal research project initiated in 2002 that has conducted cross-national comparative analyses of data from state-representative samples of adolescents in Victoria, Australia and Washington State, United States, collected with carefully matched instruments and survey methodologies (described in more detail below) [4]. Analysis of the IYDS adolescent follow-up data has revealed that the rate of Australian frequent and heavy adolescent alcohol use is at least double that in the United States [4–7]. Although predictors for alcohol use and abuse (spanning individual, peer, family, school, and community contexts) tend to be similar in the two countries [5, 8–10], several risk factors such as early age use, favourable community and family attitudes, and availability of alcohol in the family have higher prevalence in Australia [8–10]. It appears likely that the higher prevalence of these risk factors, rather than different strengths of prediction, explains the higher levels of adolescent alcohol use in Australia.

Data from the IYDS show there are lower rates of adolescent alcohol use in the United States, where policies favour delaying the age of introduction to alcohol and extending the age at which alcohol use is illegal [4]. Many Australians have reservations about adopting U.S. abstinence and zero-tolerance policies due to their costly association with policing, incarceration, and school exclusion [11, 12], and the suspicion that these policies may unintentionally lead to higher rates of alcohol and illicit drug use in young adults [13].

Evidence of alcohol-related harm in the young adult population in the United States has led to debate regarding existing U.S. alcohol policies, including the age 21 minimum legal drinking age. The U.S. National Advisory Council on Alcohol Abuse and Alcoholism has advocated that abstinence policies aimed at children and adolescents be supplemented with a greater adoption of young adult harm-minimisation programs, including efforts to train young adults to use alcohol moderately and through modified alcohol server practices [14].

Young adult alcohol use appears to be influenced both by distal adolescent development experiences [15–18] and by more proximal situational triggers operating in the social settings [19, 20], work contexts [21, 22], and sporting [23] and recreational [24] environments within which young adults use alcohol and socialise with alcohol users. The few prior studies that have explored this issue suggest that more distal adolescent risk factors, such as adolescent tobacco use, alcohol use, antisocial behaviour, and school adjustment problems, maintain significant influences on young adult alcohol use, after controlling for more proximal young adult influences [17–19, 25].

The present study aimed firstly to compare rates of alcohol and drug use for young adults in the IYDS in Victoria, Australia with age-matched U.S. samples from the Monitoring the Future study (MTF). The MTF study of young adult substance use is based on a follow-up of a representative sample of U.S. secondary school graduates [26]. Following from adolescent IYDS comparisons, we hypothesized that rates of young adult alcohol use would be higher in Australia, but rates of illicit drug use would be similar. Secondly the study aimed to estimate rates of young adult alcohol problems in Victoria, and to examine predictors of these problems on the hypothesis that both distal adolescent influences (such as patterns of early alcohol use) and proximal young adult social-environmental influences would be significant contributors.

METHOD

Participants

The *International Youth Development Study (IYDS)* is an ongoing longitudinal study that examines the development of healthy and problem behaviours among young people in Victoria, Australia and Washington State, U.S. As data from the U.S. young adult IYDS sample has not yet been collected, the present analyses focus on the Australian arm of the IYDS composed of young people from Victoria, Australia. Students were originally recruited to the IYDS in 2002 using a 2-stage cluster sampling approach to achieve a state-representative sample at each grade sampled (grades 5, 7, and 9). This approach has been described in detail elsewhere [4] and involved randomly selecting schools, probability weighting for their grade-level size, and then randomly selecting classrooms within each

school. This resulted in a sample of 2884 students that was found to be a good representation of the school-aged population of Victoria, Australia [4]. The sample was followed annually for the first 3 years of the study and at less regular intervals thereafter.

The current study utilised 2 time points extracted from this longitudinal data set. The first time point (T1; termed adolescence henceforth) was when each of the student cohorts were in grade 9 secondary school (i.e., in 2002 for the grade 9 [oldest] cohort, in 2004 for the grade 7 [middle] cohort, and in 2006 for the grade 5 [youngest] cohort). At the adolescent time point, participants ranged in age between 14 and 16 years ($M = 15.0$, $SD = 0.4$). The second time point (T2) was collected in 2010/11 when all 3 cohorts were in young adulthood and ranged in age between 18 and 24 years ($M = 21.1$, $SD = 1.7$). For the current study, outcome data was available for 2309 young people (1050 males and 1259 females) who had complete data available at both time points of interest (adolescence and young adulthood), reflecting 80% of the original sample recruited into the IYDS.

Monitoring The Future (MTF) young adult follow-up survey reports [26] were used as a cross-national comparison to the IYDS. The MTF is designed to achieve a U.S., nationally representative sample of each year's 12th-grade graduating student cohort. Classroom samples are selected using a 2-stage stratified random procedure similar to the IYDS.

Measures

Young Adulthood: IYDS—*Alcohol and drug use* were assessed with the following questions from the MTF survey [26]. Cigarettes: How frequently have you smoked cigarettes in the past 30 days? Response options were recoded from an 8-point scale to "Not at all" (0) and "Less than one per day" to "40 or more cigarettes a day" (1). Alcohol: In the past 30 days, on how many occasions (if any) have you: Had more than just a few sips of an alcoholic beverage (like beer, wine, or liquor/spirits)? Cannabis: Used marijuana (pot, weed, grass)? Other illicit drug use: Combined use of: LSD or other psychedelics; cocaine or crack; stimulants; ecstasy; heroin; and other illegal drugs. Responses were recoded "Never" (0) and "1 or 2 times" to "40 + times" (1).

Alcohol problems were assessed using the Alcohol Use Disorders Identification Test (AUDIT) [27]. The AUDIT is a screening instrument for excessive alcohol use consisting of 10 items measuring heavy alcohol use, alcohol dependence symptoms, and alcohol-related problems. Each item is scored 0 to 4 such that the AUDIT is scored from 0 to 40 problem symptoms. Scores of 8 and above are generally considered indicative of hazardous and harmful alcohol use, as well as possible alcohol dependence [28].

Demographic measures included age, non-completion of secondary school (year left school prior to completing grade 12), level of tertiary education (none [referent]; certificate or diploma; degree or higher), weekly income, currently studying, intimate and marital relationship status (not married or in an intimate relationship [ref]; in an intimate relationship; engaged, de facto or married), and accommodation context (living with parents; living with friends; other living contexts including alone, with spouse/ children, with other relatives and with non-relatives ([ref]), and whether respondents were the parent of a child.

Religious involvement was assessed by asking: "How often do you attend religious services or activities?" Response options were: Never (1) Rarely (2) 1–2 Times a Month (3) About Once a Week or More (4) [26].

Friends' alcohol use was assessed using the following IYDS questions [10]. In the past year (12 months), how many of your best friends have: Drank alcohol? Got drunk? Driven after drinking alcohol? Had an alcohol or drug problem? Response options were: None of my friends (0) to 4 of my friends (4) (Cronbach's Alpha = 0.66, Mean = 2.01, SD = 0.75. Pearson r with AUDIT scores = 0.47, n = 2,309).

Intimate partner's alcohol use was assessed using the following IYDS questions [10]. In the past year (12 months), how often has your current or most recent boyfriend/girlfriend or spouse… Drank alcohol? Got drunk? Driven after drinking alcohol? Response options were coded: Never (0), Seldom (1), Sometimes (2), Often (3), Very Often (4); Had an alcohol or drug problem? No (0) Yes (4). Scored 0 if not in a relationship in past 12 months (32.4%) (Alpha = 0.68. Mean = 0.82, SD = 0.82. r AUDIT = 0.23).

Alcohol in workplace setting (modified from Lauver et al. [22]). Respondents reported the workplace they spent the most time during the past 12 months. Do you think it is acceptable to go to work hung over? Do you think it is acceptable to go to work with alcohol in your system? Are there some instances where going to work hung over or with alcohol in your system is acceptable? Response options: NO! (1), no (2), yes (3), YES! (4). How would you describe the attitude towards workplace drinking or being under the influence of alcohol at your workplace? Not acceptable (1), Discouraged (1.75), Tolerated if not frequent (2.5), Tolerated even if frequent (3.25), Encouraged (4). Scored 0 if not working in the past 12 months (10%) (Alpha = 0.79, Mean = 1.55, SD = 0.75, r AUDIT = 0.35). The following 2 scales were devised for the present study.

Alcohol in evening socialising settings visited over the past 30 days. During your evenings socialising how often did you: See people who appear drunk or drug affected? See people behaving aggressively or threateningly? Feel threatened by people behaving aggressively? Never (1), Sometimes (2), Most (3), Always (4). At the places where you socialise during the evenings: How likely is it that: Alcohol would be available? People would be served alcohol if they were intoxicated? Very unlikely (1), Unlikely (2), Likely (3), Very Likely (4). Scored 0 if no evening socialising in the past 30 days (8%) (Alpha = 0.72, Mean = 2.20, SD = 0.80, r AUDIT = 0.38).

Alcohol in sports settings. In the past 30 days, on how many days did you go out to attend or watch sport for recreation? During these days how often did you: See people who appeared drunk or drug affected? Never (1), Sometimes (2), Most times? (3), Always (4). At the places where you attend or watch sports: How likely is it that alcohol would be available? How likely is it that people would be served alcohol if they were intoxicated? Very unlikely (1), Unlikely (2), Likely (3), Very Likely (4). Scored 0 if didn't attend sport last 30 days (36.6%) (Alpha = 0.74, Mean = 1.63, SD = 1.36, r AUDIT = 0.26).

Young Adulthood: MTF—*Alcohol and drug use* were assessed with the same questions used in the IYDS [26] for <u>Cigarettes</u>, <u>Alcohol</u> and <u>Cannabis</u>. <u>Other illicit drug use</u> combined use of: hallucinogens; cocaine; amphetamines; heroin or other narcotics; sedatives (barbiturates) or tranquilizers not under a doctor's orders. Responses were recoded "Never" (0) and "1 to 40 + times" (1).

Adolescence: IYDS—*Demographic predictors* included gender, cohort (youngest [ref]; middle or oldest) and the location of the child's school at the first survey (urban [ref]; regional; or rural) [29].

Past - month alcohol use was assessed with one question asking 'in the past 30 days, on how many occasions (if any) have you used alcohol?' Eight response options ranged from 'never' (1) to '40+ times' (8) [26].

Past-year antisocial behaviour was assessed with the average response to the following 9 questions [5, 10, 11]. How many times in the past year (12 months) have you: Been suspended from school? Carried a weapon? Stolen something worth more than $10? Sold illegal drugs? Stolen or tried to steal a motor vehicle such as a car or motorcycle? Been arrested? Attacked someone with the idea of seriously hurting them? Been drunk or high at school? Taken a handgun to school? Eight response options for each item ranged from 'never' (1) to '40+ times' (8). (Alpha = 0.59). For the adolescent alcohol and antisocial behaviour variables, 92 cases that were missing from grade 9 surveys were imputed from earlier survey responses using linked regression [30]. Results with and without these imputed values suggested the main findings were similar.

Procedure

Permission to conduct research in schools (during adolescence) was obtained from relevant educational authorities for public and private schools. Ethics approval for the Australian IYDS was obtained from The University of Melbourne Human Ethics in Research Committee and from the Royal Children's Hospital Ethics in Human Research Committee. The adolescent survey was group administered in the students' classrooms. The young adult survey was completed online after which participants received a $40 gift voucher.

Analyses were completed using STATA 12.1 [31]. Firstly, to enable comparison with the 2011 MTF young adult follow-up [26], IYDS secondary school graduates were grouped by gender and age and rates of alcohol and drug use estimated. Secondly, prevalence estimates were calculated for AUDIT scores for the entire Victorian IYDS young adult cohort. Thirdly, multivariate regression analyses were conducted to examine whether the adolescent predictors and young adult environment measures predicted the count of the continuous measure of AUDIT problem scores in young adulthood. Given the distribution of the count of AUDIT problem scores approximated the Poisson function, but with greater dispersion, negative binomial regression was used. Incidence rate ratios were estimated to assess the contribution to each unit increase in the number of AUDIT problems due to 1-unit increases in each of the adolescent and young adult predictors included in the multivariate adjusted regression model. The STATA svy command was used to adjust confidence intervals to account for the classroom clustering of students in the original sample design. Correlation

analyses revealed that associations between predictors were all below 0.52, suggesting that multivariate associations were not overly influenced by multicollinearity.

RESULTS

Table 1 presents rates of young adult alcohol and drug use for the IYDS secondary school graduates together with comparative data from the U.S. national follow-up of post-school students.

Comparisons in Table 1 show that, for all age ranges, average rates of alcohol and cigarette use in Victoria were significantly above the rates in the United States. While the combined measure of cannabis and other illicit drugs showed no cross-national differences, in the two older groups' rates of cannabis use were significantly lower and other illicit drug use higher in Victoria compared to the United States.

The Mean AUDIT score for the young adults in Victoria was 7.3 (95% Confidence Intervals [CI] 7.0 – 7.6) (Males - 8.4, CI 8.0 – 8.8; Females - 6.4, CI 6.0 – 6.7). The rate of elevated AUDIT (score of 8 or higher) was 41.2%, (CI 38.8 – 43.6%) (Males - 49.5%, CI 46.3 – 52.7%; Females - 34.3%, CI 31.1 – 37.5%). Table 2 presents the findings of the negative binomial regression analysis predicting the continuous AUDIT count scores.

Significant adolescent (grade 9) predictors of young adult AUDIT scores were: being male, regional or rural school context, and the frequency of past 30-day alcohol use. Each 1-unit increase in the frequency of adolescent alcohol use increased the risk of an additional AUDIT problem score by 4% (CI: 2 to 6%). Significant young adult factors negatively associated with decreased AUDIT scores included: the frequency of religious involvement; and being in an intimate or engaged, de facto or married relationship. Significantly increased risk was associated with: each year of school not completed prior to 12th-grade graduation, living with friends, friends' and intimate partner's alcohol use, and alcohol in the workplace, during evening socialising, and in sports settings.

DISCUSSION

The current study revealed high rates of young adult alcohol problems in a follow-up of the state cohort of students in Victoria in 2002, with 41.2% (49.5% of males and 34.3% of females) scoring above the threshold on the AUDIT in young adulthood. The hypothesis that the count of young adult AUDIT problem scores would be predicted both by distal adolescent and proximal young adult influences was supported.

The present findings also suggest that the high rates of alcohol use and related problems identified previously in adolescent IYDS state cohorts in Victoria [7–10] are maintained into young adulthood. Although the comparison to the U.S. young adults was restricted to secondary school completers and did not control for potential developmental and demographic differences in the samples, rates of alcohol, cigarette, and illicit drug use other than cannabis tended to be higher in Victoria than in the United States, even after age 21. The higher rate of illicit drug use other than cannabis in Victoria contradicted our hypotheses and was unexpected based on the direction of our previous adolescent cross-

national comparisons [4]. Illicit drugs such as amphetamines and ecstasy are reported to be commonly used in licensed alcohol sales venues (pubs and clubs) in Australia [3], and this may be one factor explaining the large increase in non-cannabis illicit drug use observed in young adulthood in the current study.

Limitations

In attempting to interpret the current findings it is important to bear in mind that the young adult risk factor findings are contemporaneously measured with AUDIT scores and therefore provide a weak basis for causal inference. Cross-national comparisons were restricted to school graduates and will be strengthened in future work through currently planned young adult follow-up of the Washington State cohorts, originally sampled to be state representative of students. Although the current measures cover a range of factors, there were cross-national differences in the illicit drug use measure, and a number of factors that may affect adolescent and young adult alcohol use were not measured. Although the analytic sample included 80% of the initially recruited cohort, attrition analyses comparing the excluded sample found a number of differences that should be considered in interpreting findings. The analytic sample had significantly lower adolescent alcohol use ($p = 0.04$), higher parent socioeconomic status ($p < 0.001$), were more likely to attend schools in regional towns rather than urban or rural areas ($p = 0.002$), and were less likely to be in the oldest cohort ($p = 0.03$). Despite these biases, reported rates of alcohol use were similar to those in same-aged Australian national surveys (e.g., at ages 18 to 19 rates of past-year alcohol use was 87.7%, CI 84.7 – 90.6% in the current sample versus 86.3% in the 2010 household survey) [32]. After weighting the data to 2011 Victorian state Census population ratios for age, gender, and early school leaving, the prevalence estimates were changed by less than 0.7% and the incidence rate ratios by less than 0.01.

The findings support prior studies [33] that point to a significant public health concern with high rates of alcohol-related harm through adolescence and maintained into young adulthood for state cohorts in Victoria. Although the current study cannot assert a causal test of the effect of state policy differences, the findings do not support the view that age 21 laws inevitably increase illicit drug substitution for alcohol.

The findings are also consistent with prior research that suggests that frequent adolescent alcohol use increases the risk of young adult alcohol use problems [16]. Previous IYDS research has established that frequent adolescent alcohol use is itself predicted by an early age of alcohol initiation [8, 9]. Evaluations in Australia of interventions, such as Communities That Care [34] are warranted, since these interventions coordinate the available evidence-based prevention interventions to reduce the age of initiation and reduce the frequency of adolescent alcohol use [35], which is shown in the present study to increase the risk of early adult alcohol problems.

The findings support and extend prior research that suggests that young adult social [19], work [21, 22], sporting [23], and recreational [24] environments each independently influence young adult alcohol use. Further cross-national and longitudinal research in this area is warranted to provide a firmer basis for planning interventions.

Acknowledgments

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WHAT THIS RESEARCH ADDS

Over 40% of young adults in Victoria, Australia (N=2,309, average age 21) scored above criteria on the Alcohol Use Disorders Identification Test (AUDIT).

Longitudinal regression analysis revealed AUDIT symptoms were predicted both by alcohol use in adolescence and young adult social environments characterised by heavy alcohol use and problems, suggesting two distinct directions for prevention efforts.

Age-matched comparisons of school graduates revealed young adults in Victoria, Australia had higher rates of alcohol, tobacco, and illicit drug use (other than cannabis use) relative to United States of America (U.S.) national samples, warranting consideration of U.S. policies.

Table 1

Cross-national comparison of substance use in the past 30 days in secondary school graduates.

Variable	Victoria IYDS 2010/ 11	USA MTF 2011 [26]	p
Age 19 to 20	N= 609	N = 1,000	
Alcohol	86.2% (83.5 – 88.9%)	52.3%	***
Cigarettes	34.3% (30.6 – 38.1%)	18.5%	***
Cannabis	17.2% (13.8 – 20.6%)	20.4%	ns
Other illicits*	9.8% (7.5 – 12.2%)	8.0%	ns
Cannabis or Other illicits*	20.5% (17.0 – 24.0%)	22.5%	ns
Age 21 to 22	N= 678	N = 1,000	
Alcohol	84.9% (81.3 – 88.6%)	69.3%	***
Cigarettes	33.0% (29.1 – 36.8%)	23.3%	***
Cannabis	17.1% (14.0 – 20.2%)	21.9%	**
Other illicits*	12.7% (9.7 – 15.7%)	8.8%	**
Cannabis or Other illicits*	21.1% (18.0 – 24.2%)	23.6%	ns
Age 23 to 24	N= 271	N = 900	
Alcohol	88.2% (84.2 – 92.2%)	75.5%	***
Cigarettes	31.7% (26.2 – 37.3%)	22.0%	**
Cannabis	12.9% (9.4 – 16.4%)	18.1%	*
Other illicits*	15.1% (10.9 – 19.3%)	9.9%	*
Cannabis or Other illicits*	21.0% (16.5 – 25.6%)	20.7%	ns

NOTE: Data refer to the sample completing secondary school.

p - significant difference in z-test of cross-national rates

***
p < 0.001,

**
p < 0.01,

*
P < 0.05,

ns = not significant

*
Other illicits: IYDS = LSD or other psychedelics; cocaine or crack; heroin; stimulants; ecstasy; other illegal drugs. MTF = hallucinogens, cocaine, heroin or other narcotics, amphetamines, sedatives (barbiturates), or tranquilizers not under a doctor's orders. USA MTF - Monitoring the Future. (Vol. 2, Table 4-4, p. 104) [26].

Table 2

Fully adjusted regression model predicting young adult AUDIT scores.

Predictor	IRR	95%	CI	p
Adolescence				
Female	0.89	0.83	0.95	***
Youngest cohort (ref)				
Middle	0.92	0.82	1.05	
Oldest	0.90	0.71	1.13	
Urban school location (ref)				
Regional town	1.10	1.02	1.19	*
Rural location	1.16	1.08	1.24	***
Past-month alcohol use	1.04	1.02	1.06	**
Past-year antisocial behaviour	1.00	0.94	1.07	
Young Adulthood				
Age	1.03	0.98	1.09	
Religious involvement	0.92	0.89	0.96	***
Not completed secondary school	1.05	1.00	1.11	*
Income	1.00	0.99	1.02	
Tertiary Education (None: ref)				
Certificate, Diploma	0.97	0.89	1.06	
Degree or Higher	0.92	0.81	1.05	
Currently Studying	1.01	0.95	1.09	
Not in a married or intimate relationship (ref)				
Intimate relationship	0.85	0.80	0.91	***
Engaged, de facto or married	0.83	0.76	0.90	***
Living context (Other: ref)				
Lives with parents	1.02	0.94	1.11	
Lives with friends	1.18	1.09	1.28	***
A parent	0.88	0.74	1.04	
Friends' alcohol use	1.41	1.33	1.48	***
Intimate partner's alcohol use	1.12	1.08	1.16	***
Alcohol in workplace settings	1.20	1.15	1.26	***
Alcohol in evening socialising settings	1.28	1.21	1.35	***
Alcohol in sports settings	1.04	1.02	1.06	***

IRR: Incidence Rate Ratio. 95% CI: 95% Confidence Interval.

*
p 0.05,

**
p < 0.01,

***
p < 0.001