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ORIGINAL ARTICLE

Distinct Drinking Patterns, Help Seeking, and Alcohol-Related Regret in ADHD, Autism, and AuDHD

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Abstract

ADHD is associated with higher alcohol use, while autism is linked to lower use, but little is known about patterns among individuals with both conditions (AuDHD), particularly when accounting for mental health. This study examined whether alcohol consumption, drunkenness, regret, and help-seeking differ across ADHD, autism, AuDHD, and controls, and whether regret predicts intentions to reduce drinking. Using data from the 2021 Global Drug Survey ($N = 21{,}246$), we conducted descriptive analyses and multilevel regression models controlling for mental health and demographics. ADHD respondents had the highest AUDIT scores; autism respondents drank less overall but were more likely to fall into the possible dependence category. AuDHD respondents reported the most frequent drunkenness, highest regrets, and greatest desire to reduce drinking (42.3%). Regret strongly predicted wanting to drink less, especially for AuDHD (OR = 6.65). Findings highlight distinct risk profiles and position regret as a promising intervention target.

Keywords Alcohol · Drunkenness · Regret · ADHD · Autism · Alcohol help seeking

Alcohol use disorder (AUD) is a major global health concern, and emerging evidence suggests that neurodevelopmental conditions may influence both risk and patterns of alcohol use.

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Individuals with attention deficit/hyperactivity disorder (ADHD) appear particularly vulnerable, with co-occurrence rates of AUD and ADHD ranging from 35 to 71% (Haasbroek & Morojele, 2022; Ohlmeier et al., 2008). In contrast, autism spectrum disorder has often been associated with lower alcohol consumption (Croen et al., 2015; Weir et al., 2021). However, when ADHD and autism co-occur (AuDHD; estimated to be around 40%; Rong et al., 2021), the risk of AUD appears to increase substantially (Butwicka et al., 2017; Huang et al., 2021). Despite these findings, research rarely considers AuDHD as a distinct group, leaving important questions about alcohol-related behaviors unanswered, and gaps in treatment and support.

Mechanisms underlying these associations are complex. Transdiagnostic factors such as impulsivity and alexithymia (difficulty identifying and expressing emotions) have been shown to mediate relationships between neurodevelopmental traits and alcohol use. For example, impulsivity, a core feature of ADHD, has long been linked to hazardous drinking (Dick et al., 2010; Sliedrecht et al., 2021). Recent work demonstrates that impulsivity and alexithymia fully mediate the positive relationship between ADHD symptoms and alcohol risk, and partially mediate the relationship between autism and alcohol use (Lyvers et al., 2024). These findings suggest that while autism alone may be associated with lower alcohol consumption, co-occurring traits such as impulsivity may elevate risk, particularly in AuDHD. Understanding these mechanisms is critical for tailoring interventions, yet most studies focus narrowly on diagnostic categories rather than shared traits or combined presentations.

Beyond consumption, help-seeking intentions and readiness to change are key determinants of harm reduction. In the general population, approximately one-third of drinkers report wanting to cut down, and around 8% seek help (Davies et al., 2019). Whether these patterns hold for ADHD, autism, or AuDHD is unknown. Unique characteristics such as impulsivity in ADHD or alexithymia in autism may shape help-seeking behaviors, and stigma or lack of awareness may further reduce help-seeking among those with AuDHD (Patterson et al., 2019). Without this knowledge, services risk failing to meet the needs of these groups.

Another underexplored factor is regret. Regret about drinking-related behavior can motivate reductions in consumption (Brewer et al., 2016; Cooke et al., 2007). However, research in the general population shows a paradox: heavier drinkers report more regrettable episodes but proportionally less regret than lighter drinkers (Davies & Joshi, 2018; Davies et al., 2024). While ADHD has been linked to heightened post-decision regret (Schepman et al., 2010) and autism to reduced regret (Zalla et al., 2014), alcohol-related regret in these groups has not been examined. This gap is striking given that regret may influence intentions to change drinking behavior.

Mental health comorbidities add further complexity. Rates of co-occurring mental health conditions are high—up to 75% in ADHD and 50% in autism (Pehlivanidis et al., 2020) and conditions such as anxiety and depression are themselves risk factors for heavy drinking (Boden & Fergusson, 2011). Social anxiety, for example, has been linked to hazardous drinking in autistic individuals (Bowri et al., 2021), while impulsivity in ADHD may diminish reflective thinking and reduce experiences of regret (Jo et al., 2014; Lebeña et al., 2023). Yet, few studies account for mental health status when examining alcohol use in neurodevelopmental conditions, making it difficult to disentangle these influences.

Taken together, existing research leaves critical gaps: (1) alcohol-related regret has not been studied in ADHD, autism, or AuDHD; (2) help-seeking intentions in these groups remain unclear; and (3) the role of mental health comorbidity in these relationships is rarely addressed. The current study addresses these gaps by examining alcohol use, help-seeking intentions, and experiences of regret among individuals with ADHD, autism, AuDHD, and those without neurodevelopmental conditions, while controlling for mental health status. Specifically, our research questions (RQs) were:

1. How does AUD risk differ across these groups?
2. How do help-seeking intentions compare?
3. What are the patterns of drunkenness and regretted episodes?
4. Does regret predict intentions to reduce drinking, and does this vary by group?

Methods

Design and Procedure

The GDS is an anonymous, online, cross-sectional survey of licit and illicit substance use. GDS2021 ran from December 2020 to March 2021 and was translated into 11 languages (German, English, French, Dutch, Hungarian, Spanish, Finnish, Portuguese, Danish, Romanian and Italian). Participants were recruited through the Global Drug Survey's international network using online channels, including mainstream media, social media, and harm reduction organizations. Further methodological details are provided in Winstock et al. (2022). GDS is a non-probability survey and not intended to be representative of the populations within the included countries. Nonetheless, it has been demonstrated that GDS recruits people who use alcohol and cannabis who are similar in age and gender to people completing general household surveys in Australia, the United States and Switzerland (Barratt et al., 2017). The GDS received ethics approval from University College London (11,671/001), which was registered at RMIT University (2020–23913–11,758) and The University of Queensland (2,017,001,452). The study was reported according to STROBE guidelines for cross-sectional studies (von Elm et al., 2007).

Participants

There were 33,220 respondents who took part in GDS2021. The sample for this study was restricted to those who reported consuming alcohol and responded to the regret section of the survey (final $N = 21{,}246$).

Measures

Risk of Alcohol Dependence and Harm

This was measured using the ten item Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001). Scores range from 0 to 40 and respondents' classification of alcohol dependence based on AUDIT scores are categorized as lower risk (0–7), increasing risk (8–15), higher risk (16–19), and possible alcohol dependence (20+).

ADHD, Autism, and Mental Health

Respondents were asked if they had a lifetime diagnosis of the following conditions; ADHD; autism; depression; anxiety panic attacks or phobia; bipolar disorder; obsessive compulsive disorder, post-traumatic stress disorder; psychotic illness/schizophrenia; other; none of the above.

Getting Drunk and Regrets

Respondents were presented with a definition of drunkenness (see Appendix, which was "we define drunk as having consumed so much that your physical and mental faculties are impaired to the point your balance/speech may be affected, you are unable focus on clearly on things and your conversation and behaviors are disinhibited") and asked to enter the number of times they got drunk in the last 12 months. Those who indicated they got drunk one or more episodes were asked what percentage of these occasions they regretted getting drunk (i.e., they wished they had drunk less or not drunk at all).

Respondents who reported regretting getting drunk were asked to select their top three factors they believed contributed to that regret from a list of ten. These factors reflected circumstances or behaviors that respondents associated with regrettable drinking episodes, such as (1) drank too much too quickly; (2) mixed my drinks; (3) I was with big drinkers; (4) took other drugs at the same time; (5) I hadn't drunk for a while due to COVID-19 restrictions; (6) I drank too much because of being on an online party; (7) I was feeling anxious about COVID or other life events; (8) I mixed alcohol with medication; (9) I'd started drinking much earlier than normal; and (10) I drank something I usually do not drink (e.g., spirits).

Drinking Less and Help Seeking

Respondents were asked "would you like to drink less alcohol over the next 12 months?" and those who indicated yes were asked "would you like help to drink less over the next 12 months?" (yes/no). Those who indicated interest in support to reduce drinking were asked "are you planning to seek help to support you cut down on your drinking over the next 12 months" (yes/no). Finally, respondents were asked "in the last 12 months have you sought emergency medical treatment following the use of alcohol" (yes/no). This timeframe reflects the survey's design and captures broader motivation rather than immediate intentions.

GDS2021 also contained a broad range of demographic measures but for the purpose of this study we only include gender (derived from sex assigned at birth and gender identity), age, student status, employment, and country of residence as these are known to be associated with drinking patterns and behaviors (GBD, 2020; Alcohol Collaborators, 2022). All survey measures can be found in Appendix A.

Analysis

Respondents were classified into four mutually exclusive groups: ADHD only, autism only, AuDHD (both ADHD and autism), and no ADHD or autism. Mental health status (any diagnosis vs. none) was included as a covariate in all models. To explore potential effect modification, we added an interaction term between ADHD/autism group (four categories) and mental health status in the negative binomial models predicting (i) frequency of drunkenness and (ii) regret. Interaction terms were not statistically significant in either model and the main-effect patterns were unchanged; therefore, detailed interaction estimates are not presented.

Data were explored using descriptive statistics and chi-square tests of association to understand differences in demographic characteristics, alcohol consumption, drunkenness, regrets, and help-seeking between the groups. Reasons for regretting getting drunk

were explored with descriptive statistics and presented graphically to allow comparisons between groups.

Predictors of the frequency (or count) of times drunk, percentage of regrets, and intentions to drink less were analyzed with multi-level multivariable negative binomial regression models (to account for any over-dispersion in the data). Exponentiated coefficients from these models are presented as incidence rate ratios (IRRs), which indicate the relative change in the expected count for a one-unit change in the predictor. Countries with fewer than 100 respondents were excluded because such sparse data can produce unstable random effect estimates, inflate standard errors, and potentially bias model results. Country was included as a random effect (intercept only), and respondent group, gender, AUDIT categories, age categories, student status, and employment status were entered as fixed effects. Mental health status (any diagnosis vs. none) was included as a covariate in all models. In the regret model, the number of times drunk in the last 12 months was also entered as a fixed effect. In the model exploring intentions to drink less, the interaction between ADHD/autism group and regret was also entered as a fixed effect, and only those covariates that were significant in the first two models were entered. To explore the interaction, separate models were conducted by group. Analyses were conducted in SPSS.

Results

Sample

The final sample for this study included 21,246 respondents; 1365 (6.4%) with ADHD, 323 (1.6%) with autism, 163 (0.8%) with AuDHD, and 19,386 (91.2%) without ADHD or autism (see Table 1). In terms of demographic characteristics, the ADHD, autism, and AuDHD groups had higher proportions of respondents identifying as trans and non-binary, were younger, more likely to be of non-white ethnicity, and were more likely to report a mental health condition than the group without ADHD and/or autism. Respondents in both the autism and AuDHD group were more likely to be studying and not in employment than the other groups.

RQ1: Risk of AUD

There was a significant difference in the average AUDIT scores between groups. Notably, the ADHD group had significantly higher AUDIT scores compared to the autism group and the control group, and the autism group had significantly lower AUDIT scores compared to the control group. There were significantly higher proportions of respondents with ADHD (7.4%) in the possible dependence AUDIT category than without ADHD and/or autism (4.9%; see Table 2). Overall, 1.8% of the sample had sought emergency medical treatment (EMT) in the last 12 months after drinking alcohol. Respondents with AuDHD were more likely to report EMT in the last 12 months compared to the other groups.

RQ2: Help Seeking Intentions

The AuDHD group had the highest proportion of respondents (42.3%) indicating a desire to drink less in the next 12 months. Respondents with autism (29.2%) were significantly

Table 1 Sample sociodemographic characteristics

	Total sample	ADHD	Autism	AuDHD	No ADHD or autism (control)	Test of difference or association, effect size ¥
Total *N* (%)	**21,246**	**1365 (6.4)**	**332 (1.6)**	**163 (0.8)**	**19,386 (91.2)**	
Age						$F = 152.43$, ** $E^2 = .021$
Age Mdn (p25–p75)	31 (24–41)	25 (21–32)	27 (21–38)	24 (20–31)	32 (24–42)	
Gender *N* (%)						$\chi^2 = 488.83$**, V = .107
Cis woman	7458 (35.1)	356 (26.1)[a]	84 (25.6)[a,b]	39 (23.9)[a]	6979 (36.0)[b]	
Cis man	13,085 (61.6)	893 (65.4)$_a$	195 (59.7)[a,b]	92 (56.4)[a,b]	11,905 (61.4)[b]	
Trans/nonbinary	704 (3.3)	116 (8.5)[a]	53 (16.0)[b]	32 (19.6)[b]	502 (2.6)[c]	
Ethnicity *N* (%)						$\chi^2 = 18.97$** V = .031
White	18,430 (91.3)	1187 (88.6)[a]	294 (93.0)[a,b]	135 (86.5)[a,b]	16,814 (91.5)[b]	
Other ethnicity	1759 (8.3)	153 (11.4)[a]	22 (7.0)[a,b]	21 (13.5)[a,b]	1563 (8.5)[b]	
Missing	1057	25	16	7	1009	
Mental health *N* (%)						$\chi^2 = 794.39$** V = .193
No	13,464 (63.4)	481 (35.2)[a]	105 (31.6)[a,b]	37 (22.7)[b]	12,841 (66.2)[c]	
Yes	7782 (36.60)	884 (64.8)[a]	227 (68.4)[a,b]	126 (77.3)[b]	6545 (33.8)[c]	
Employment *N* (%)						$\chi^2 = 295.75$** V = .084
Full time	10,990 (52.0)	512 (37.7)[a]	99 (29.9)[a,b]	41 (25.2)[b]	10,338 (53.6)[c]	
Part time	4051 (19.2)	305 (22.4)[a]	63 (19.0)[a,b]	29 (17.8)[a,b]	3654 (18.9)[b]	
Not employed	6110 (28.9)	542 (39.9)[a]	169 (51.1)[b]	93 (57.1)[b]	5306 (27.5)[c]	
Missing	95	6	1	-	88	
Student status *N* (%)						$\chi^2 = 148.79$** V = .059
Full time	4376 (20.7)	416 (30.6)[a]	88 (26.5)[a]	45 (27.6)[a,b]	3827 (19.8)[a]	
Part time	1706 (8.1)	160 (11.8)[a]	26 (7.8)[a,b]	16 (9.8)[a,b]	1504 (7.8)[b]	
Not studying	15,096 (71.3)	784 (57.6)[a]	218 (65.7)[a,b]	102 (62.6)[a,b]	13,992 (72.4)[c]	
Missing	68 (0.3)	5			63	

¥ = ANOVA test for age, Chi Squared test of association for other variables. **$p < .001$. Each superscript letter denotes a subset of ADHD/Autism groups that do not differ significantly from each other at the 0.05 level

less likely to want to drink less alcohol in the next 12 months compared with those with ADHD (37.3%) AuDHD (42.3%) and the control group (36.6%; Table 2). Of those reporting that they wanted to drink less alcohol in the next 12 months, the control group (10.4%) was the least likely to want help to drink less in the next 12 months.

RQ3: Experiences of Drunkenness and Regret

Respondents with ADHD (mean = 19.85, Mdn = 5) and those with AuDHD (mean = 25.18, Mdn = 4) reported the highest frequency of getting drunk in the last 12 months. The autism group had the highest proportion who reported not getting drunk at all in the last 12 months (30.3%). Respondents with AuDHD reported the highest percentage of regrets (mean = 27.30%, Mdn regret 10% of times drunk). The highest proportion of respondents with no regrets from getting drunk in the last 12 was in the control group 37.9%).

The most common factors contributing to regretted drinking episodes in the sample were drinking too much too quickly (68.8%), mixing drinks (33.4%), or being with big drinkers (31.0%, see Fig. 1). A greater proportion of people with ADHD (30.6%) or with AuDHD (32.1%) reported that their getting drunk was relating to taking other drugs compared with other respondents. A greater proportion of people with autism (33.8%) or AuDHD (30.9%) reported getting drunk because they were feeling anxious compared with other respondents. The AuDHD group had the highest proportion of respondents reporting that they got drunk due to mixing alcohol with medication.

Predictors of Getting Drunk and Regret

Table 3 presents IRRs and 95% confidence intervals for predictors of drunkenness and regret. Controlling for all other co-variates the first regression model in Table 3 shows that the autism group (IRR = 0.81; 95% CI 0.69–0.94), got drunk significantly less often than the control group. Getting drunk more often was associated with being a cis man or being trans/non-binary compared to being a cis-women, in higher AUDIT groups compared to the low-risk group, being younger in age, working full time compared to not working, being a student and having a mental health condition (IRR = 1.08; 95% CI 1.04–1.13),

Controlling for all other covariates, the second model in Table 3 shows that having more regrets related to being drunk was associated with being a cis woman compared to a cis man, being older, being in the higher AUDIT groups compared to low risk, and having a mental health condition (IRR = 1.19 95% CI 1.10–1.28).

RQ4: Relationship Between Regret and Intentions to Reduce Drinking in the Next 12 Months

The regression model in Table 4 shows that after controlling for all co-variates, wanting to drink less in the next 12 months was associated with having more regrets, being in older age categories, compared to younger, being in higher risk AUDIT groups compared to low risk and having a mental health condition. There was a significant interaction between the respondent group and regret (p=. 029). This was further explored in four separate models for each group. The experience of regret was significantly associated with greater odds of wanting to reduce alcohol consumption in the next 12 months in all groups. The highest odds ratio was found in the AuDHD group (OR = 6.65, 95% CI = 2.16–20.51; p = .001), followed by the

Table 2 Alcohol consumption, regret and help seeking

	Total sample	ADHD	Autism	AuDHD	No ADHD or autism (control)	Test of difference or association, effect size ¥
Total N (%)	**21,246**	**1365 (6.4)**	**332 (1.6)**	**163 (0.8)**	**19,386 (91.2)**	
AUDIT						
AUDIT mean (SD)	7.91 (5.82)	8.86 (6.48)	7.38 (6.29)	8.42 (7.15)	7.85 (5.75)	$H=37.17^{**}$ $E^2=.001$ H*
AUDIT Mdn (p25–p75)	6 (4–11)	7 (4–12)	6 (3–10)	6 (4–11)	6 (4–11)	
AUDIT categories *N* (%)						
Low risk	12,282 (57.8)	709 (51.9)[a]	212 (63.9)[b]	92 (56.4)[a,b]	11,269 (58.1)[a,b]	$\chi^2=44.42^{*}$, V=.026
Increasing risk	6655 (31.3)	455 (33.3)[a,b]	82 (24.7)[b]	50 (30.7)[a,b]	6068 (31.3)[a]	
Higher risk	1232 (5.8)	100 (7.3)[a]	18 (5.4)[a]	7 (4.3)[a]	1107 (5.7)[a]	
Possible dependence	1077 (5.1)	101 (7.4)[a]	20 (6.0)[a,b]	14 (8.6)[a,b]	942 (4.9)[b]	
Drunk last 12 months						
Times drunk mean (SD)	13.55 (33.89)	19.85 (41.80)	15.43 (38.42)	25.18 (58.60)	12.98 (32.84)	
Times drunk Mdn (P25–p75)	3 (0–10)	5 (1–20)	3 (0–10)	4 (0–20)	3 (0–10)	$H=101.46^{**}$ $E^2=.005$ H*
Not drunk last 12 months *N* (%)	5736 (27.3)	242 (17.9)	100 (30.3)	40 (25.2)	5354 (27.9)	
Missing	202	16	2	4	180	
Regret last 12 months						
% regret mean (SD)	21.35 (31.83)	22.36 (31.75)	24.88 (34.14)	27.30 (33.07)	21.16 (31.78)	
% regret Mdn (P25–p75)	3 (0–30)	5 (0–35)	5 (0–50)	10 (0–50)	3 (0–30)	$H=10.04^{*}$ $E^2=.003$ H*
Missing	246	23	6	3	214	
No regrets *N* (%)	5679 (37.7)	386 (35.6)[a]	82 (36.6)[a]	35 (30.2)[a]	5168 (37.9)[a]	$\chi^2=5.29$, V=.019
Had regrets *N* (%)	9394 (62.3)	699 (64.4)[a]	142 (63.3)[a]	81 (69.8)[a]	8470 (62.1)[a]	
EMT last 12 months (*N*%)						
Yes	235 (1.1)	30 (2.2)[a]	6 (1.8)[a,b]	9 (5.5)[c]	190 (1.0)[b]	$\chi^2=48.21^{**}$, V=.048
No	21,006 (98.9)	1335 (97.8)[a]	326 (98.2)[a,b]	154 (94.5)[c]	19,191 (99.0)[b]	
Missing	5	-	-	-		
Drink less next 12 moths *N* (%)						

Table 2 (continued)

	Total sample	ADHD	Autism	AuDHD	No ADHD or autism (control)	Test of difference or association, effect size ¥
No	13,473 (63.4)	855 (62.7)[a]	235 (70.8)[b]	94 (57.7)[a]	12,289 (63.4)[a]	$\chi^2 = 10.40$, V = .022
Yes	7767 (36.6)	509 (37.3)[a]	97 (29.2)[b]	69 (42.3)[a]	7092 (36.6)[a]	
Missing	6	1	-	-	5	
Help to drink less *N* (%)						
No	6888 (88.9)	416 (81.9)[a]	83 (85.6)[a,b]	55 (79.7)[a]	6334 (89.6)[b]	$\chi^2 = 35.67$**, V = .068
Yes	857 (11.1)	92 (18.1)[a]	14 (14.4)[a,b]	14 (20.3)[a]	737 (10.4)[b]	
Missing	22	1	-	-	21	
Planning to seek help *N* (%)						
No	413 (48.5)	40 (43.5)[a]	5 (35.7)[a]	7 (50.0)[a]	361 (49.3)[a]	$\chi^2 = 2.05$, ns V = .049
Yes	439 (51.5)	52 (56.5)[a]	9 (64.3)[a]	7 (50.0)[a]	371 (50.7)[a]	
Missing	5	-	-	-	5	

¥ = Kruskal–Wallis test for AUDIT, times drunk and % regret. Chi-squared tests for other variables. *$p < .05$, **$p < .001$. For chi-squared tests, each superscript letter denotes a subset of the groups that do not differ significantly from each other at the 0.05 level. H* = Pairwise comparisons adjusted for the number of tests for AUDIT score showed that there were significant differences between the following groups; autism and ADHD; autism and control; and ADHD and control. Pairwise comparisons adjusted for the number of tests for times drunk showed that there were significant differences between the following groups; autism and ADHD; control and ADHD. Pairwise comparisons adjusted for the number of tests for regret showed no remaining difference between groups

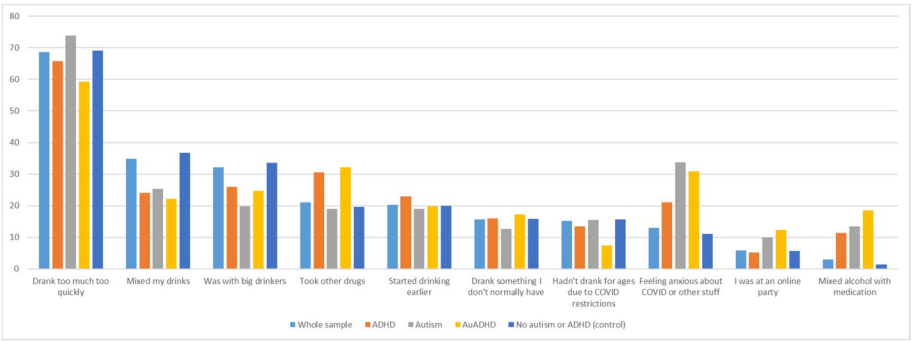

Fig. 1 Circumstances associated with regretted drunken episodes across groups. Figure includes respondents who indicated at least one regret $N = 9394$

ADHD group (OR = 3.75, 95% CI = 2.67–5.26, $p < .001$), the autism group (OR = 2.88, 95% CI = 1.32–6.28, $p = 008$), and the control group (OR = 2.53, 95% CI = 2.32 = 2.76, $p < .001$).

Discussion

This study examined patterns of alcohol use, help-seeking intentions, and experiences of regret among individuals with ADHD, autism, and AuDHD in a large international sample. To our knowledge, this is the first study to explore regret as a predictor of intentions to reduce drinking across these neurodivergent groups while controlling for mental health co-occurrence. Respondents with ADHD had the highest AUDIT scores, and all three neurodivergent groups were at greater risk of AUD compared to controls, consistent with previous research (Butwicka et al., 2017; Haasbroek & Morojele, 2022; Huang et al., 2021; Ressel et al., 2020). Although the autism group was more likely than controls to fall into the possible dependence category, they reported the lowest average AUDIT scores and least frequent drunkenness, aligning with evidence that autism alone is associated with lower alcohol use (Croen et al., 2015; Weir et al., 2021). This pattern suggests that while overall consumption may be lower, autistic individuals who do drink could be at heightened risk of developing dependence. In contrast, respondents with AuDHD reported getting drunk most frequently and were most likely to report emergency medical treatment after drinking, reinforcing prior findings that co-occurring ADHD and autism heighten risk (Haasbroek & Morojele, 2022) and indicating elevated risk of severe alcohol-related harm.

A novel contribution of this study was examining desire to reduce drinking and help-seeking intentions. Around one-third of the overall sample wanted to drink less in the next 12 months (similar to Davies et al., 2019), rising to 42.3% among AuDHD respondents. Autistic respondents were least likely to want to drink less, consistent with their lower overall consumption, whereas all three neurodivergent groups expressed greater willingness to seek help than controls. Importantly, these patterns persisted after controlling for mental health conditions, suggesting that neurotype-specific factors contribute independently to risk and motivation. Barriers identified in prior work, executive dysfunction, inaccessible sensory environments, communication mismatches, and a paucity of neurodivergent-informed services, remain salient (Lohit et al., 2019; Matson-Koffman et al., 2005; Raymaker et al., 2016) and negative prior experiences may further discourage help-seeking (Green et al., 2025). These

Table 3 Results of multi-level multivariable negative binomial regression models with country included as a random effect. Table presents incidence rate ratios (IRRs), confidence intervals and significance of the included variables associated with frequency of drunkenness and regret

	Drunkenness $N = 20{,}935$					**Regrets $N = 15{,}011$**				
	Effect	IR	Lower 95% CI	Upper 95% CI	*p*	Effect	IR	Lower 95% CI	Upper 95% CI	*p*
Drunkenness	-	-	-	-	-	$F = 20.71$	0.998	0.997	0.999	<.001
Group	$F = 3.27$					$F = 1.00$				
ADHD		0.947	0.874	1.025	0.178		0.985	0.862	1.126	0.827
Autism		0.806	0.690	0.941	0.006		1.119	0.849	1.475	0.423
AuDHD		1.094	0.882	1.358	0.413		1.343	0.919	1.963	0.128
No autism or ADHD (control) (ref)										
Gender	$F = 60.96$					$F = 21.72$				
Trans/non-binary		1.177	1.057	1.314	0.004		0.871	0.721	1.054	0.156
Cis man		1.266	1.21	1.320	<.001		0.782	0.727	0.841	<.001
Cis woman (ref)										
Age	$F = 496.10$					$F = 2.04$				
55 +		0.213	0.195	0.232	<.001		1.243	1.043	1.483	0.015
35–54		0.429	0.404	0.456	<.001		1.044	0.940	1.160	0.418
25–34		0.670	0.634	0.709	<.001		1.056	0.964	1.158	0.242
16–24 (ref)										
AUDIT categories	$F = 3825.05$					$F = 107.35$				
Possible dependence		28.189	25.892	30.690	<.001		3.197	2.732	3.741	<.001
Higher risk		12.606	11.645	13.647	<.001		2.267	1.984	2.590	<.001
Increasing risk		5.071	4.862	5.289	<.001		1.561	1.451	1.680	<.001
Low risk (ref)										
Employment	$F = 10.28$					$F = 0.17$				
Not working		0.886	0.841	0.934	<.001		1.023	0.934	1.121	0.626
Part time		0.948	0.898	1.000	0.050		0.996	0.907	1.094	0.936

Table 3 (continued)

	Drunkenness $N = 20{,}935$					**Regrets $N = 15{,}011$**				
	Effect	IR	Lower 95% CI	Upper 95% CI	*p*	Effect	IR	Lower 95% CI	Upper 95% CI	*p*
Full time (ref)										
Student status	$F = 4.62$					$F = 0.42$				
Yes full time		1.093	1.032	1.158	0.002		0.968	0.880	1.066	0.513
Yes part time		1.031	0.958	1.109	0.416		1.031	0.910	1.168	0.630
No (ref)										
Mental health conditions	$F = 14.17$					$F = 22.59$				
Yes		1.084	1.039	1.130	<.001		1.193	1.109	1.282	<.001
No (ref)										
RE Var (SE)	0.117	(0.039)				0.019	(0.009)			
ICC	0.084					0.036				

Table 4 The relationship between experiences of regret and intentions to reduce drinking in the next 12 months. Tables show results of binary logistic regression models predicting intentions to reduce drinking controlling for age, gender, student status, mental health and AUDIT group, with the interaction between regret and group

	Intentions to drink less in the next 12 months $N = 15{,}037$				
	Effect	OR	Lower 95% CI	Upper 95% CI	*p*
Group	$F = 0.847$				0.467
ADHD		0.659	0.261	1.665	0.062
Autism		0.762	0.414	1.402	0.383
AuDHD		0.659	0.261	1.665	0.378
No ADHD or autism (control) (ref)					
Regrets	$F = 59.270$				<.001
Has regrets		2.527	2.317	2.755	<.001
No regrets (ref)					
Group × regret	$F = 2.99$				0.029
ADHD with regret		1.500	1.079	2.087	0.016
Autism with regret		1.040	0.510	2.119	0.914
AuDHD with regrets		2.664	0.935	7.588	0.067
Gender	$F = 0.443$				0.642
Trans/non-binary		0.915	0.738	1.136	0.442
Cis man		1.012	0.933	1.098	0.776
Cis woman (ref)					
Age	$F = 106.355$				<.001
55 +		3.605	2.962	4.389	<.001
35–54		2.604	2.323	2.920	<.001
25–34		1.771	1.602	1.957	<.001
16–24 (ref)					
AUDIT categories	$F = 382.330$				<.001
Possible dependence		12.493	10.294	15.163	<.001
Higher risk		5.689	4.908	6.594	<.001
Increasing risk		2.545	2.346	2.761	<.001
Low risk (ref)					
Student status	$F = 7.395$				<.001
Yes full time		0.868	0.783	0.963	0.007
Yes part time		1.158	1.011	1.326	0.034
No (ref)					
Mental health	$F = 15.067$				
Yes		1.172	1.082	1.270	<.001
No					
RE Var (SE)	0.66 (0.24)				
ICC	0.314				

Odds ratio comparison to explore interaction between group and regret on intentions to reduce. Control OR = 2.528 (2.317–2.757) $p < .001$. AuDHD OR = 6.650 (2.157–20.506) $p = .001$. Autism OR = 2.879 (1.321–6.276) $p = .008$. ADHD 3.750 (2.672–5.263) $p < .001$

findings underscore the need for services that are both motivationally responsive and adapted to neurodivergent needs.

Another novel aspect was the examination of regret after drinking. AuDHD respondents reported the highest regret, followed by those with mental health conditions and those with autism. Contrary to earlier work suggesting fewer regrets among autistic individuals (Zalla et al., 2014), our sample showed that regret was common even where drinking was less frequent. Interestingly, AuDHD respondents reported both more frequent drunkenness and more regrets, opposite to general population patterns where frequent drunkenness often predicts fewer regrets (Davies & Joshi, 2018; Davies et al., 2024). Emotional processing and social context may explain this discrepancy: masking, social anxiety, self-criticism, and internalized stigma can amplify regret in autistic adults (Botha & Frost, 2018).

Regarding factors contributing to regretted drunkenness, the most frequent in our sample were drinking too much too quickly, mixing drinks, and being with heavier drinkers. For people with ADHD, drinking too quickly may reflect impulsivity and a tendency to seek the sensation of intoxication more rapidly (Luderer et al., 2021); for autistic individuals, faster drinking may function as a coping mechanism in socially demanding or sensory-intense situations. Autistic and AuDHD respondents were more likely to report drinking due to anxiety (Bowri et al., 2021). AuDHD respondents were also more likely to report mixing alcohol with medication and, along with ADHD respondents, using other drugs when drunk. behaviors that compound risk and should be addressed explicitly in harm reduction messaging.

Regression analyses clarified the broader patterning of risk. Controlling for covariates, the autism group got drunk significantly less often than controls. More frequent drunkenness was associated with being a cis man or trans/non-binary (vs. cis woman), consistent with evidence that gender norms shape drinking patterns and risk behaviors (Cook et al., 2025; Erol & Karpyak, 2015). Greater regret was associated with being a cis woman, aligning with research showing women report more regret and experience greater alcohol-related harms at lower consumption levels (Cox et al., 2025; Davies et al., 2024). These gendered and life-stage differences suggest that interventions may need to consider gendered drinking norms and age-specific contexts alongside neurotype.

A key contribution is our test of whether regret predicts intentions to reduce drinking. Regret was a robust predictor across the sample echoing prior work on anticipated regret as a motivator for behaviour change (Cooke et al., 2007; Cox et al., 2025; Davies & Joshi, 2018). However, the regret × group interaction showed the effect was strongest in AuDHD (OR = 6.65), followed by ADHD (OR = 3.75), autism (OR = 2.88), and controls (OR = 2.53). This graded pattern indicates that the combination of ADHD and autism amplifies both exposure to risk (more drunkenness, more mixing with medication/other drugs) and the emotional/reflective consequences (more regret), creating a distinct profile of vulnerability and motivation for change. These findings position regret as a promising, actionable target within neurodivergent-informed interventions (e.g., leveraging recent regret in brief motivational work, while ensuring materials are accessible given executive function and sensory needs).

Strengths and Limitations

This study controlled for mental health conditions, which were associated with most variables, yet differences persisted between neurodivergent groups and controls. Key

strengths include the large sample and the inclusion of three distinct neurodivergent groups, allowing nuanced comparisons. Limitations include the cross-sectional design, reliance on self-reported diagnoses, and use of lifetime rather than current measures of distress or symptom severity. Although mental health was included as a covariate residual confounding by severity or type of mental health condition may remain. Although we tested ADHD/autism group × mental health status interactions, these were not statistically significant in models of drunkenness or regret. However, subgroup sizes were relatively small particularly for the AuDHD group, so the power to detect moderation may have been limited. Future studies with larger subgroup samples and prespecified interaction analyses should examine whether mental health status modifies associations between neurotype and alcohol-related outcomes.

The GDS measures intentions over a 12-month timeframe, which may capture broader motivation but differs from shorter-term measures (e.g., 1–3 months) commonly used in behavioral research. Future studies should examine whether shorter-term intentions yield different patterns, particularly for neurodivergent groups. The GDS also may overrepresent individuals who use illicit substances. Future research should examine whether patterns different when stratifying for other substance use. Experiences of regret may also vary by culture and gender as well as neurotype, meaning some groups may over- or under-report regret. Future research should explore these intersections to better understand how cultural norms and gendered expectations shape drinking patterns and emotional responses.

Implications and Conclusions

Individuals with AuDHD were more likely to want to reduce drinking and seek help, and these intentions were partly driven by regret. Given the elevated risk profile in AuDHD, including higher frequencies of drunkenness, greater likelihood of emergency medical treatment, and more frequent mixing with medication/other drugs, one-size-fits-all approaches are unlikely to succeed. Interventions should address regret directly, for example, through timely, brief, and concrete coping plans following regretted episodes. They should also accommodate sensory, communication, and executive function needs by offering predictable environments, concise stepwise goals, and options for asynchronous support. In addition, strategies must target context-specific risks such as drinking too quickly, mixing alcohol with medication or other drugs, and anxiety-driven drinking. Future work should integrate gender and cultural tailoring into neurodivergent-informed approaches.

In collaboration with those with lived experience while writing this paper, we have found that people with ADHD and/or autism often report that alcohol and other drug use can be both enabling and complicating. While such substances may temporarily ease hyperawareness or social inhibition, offering a sense of freedom, they can also impair self-regulation, particularly when used to cope with anxiety or sensory overload. This duality underscores the importance of interventions and further research that acknowledge these motives rather than dismiss them. By identifying regret as a key motivator and highlighting distinct risk profiles, this study provides actionable insights for harm reduction strategies that are both neurodivergent-informed and context-sensitive.

Appendix A

All Survey Items from GDS2021 Used in the Current Paper.

Regrets: Presented to All Respondents Who Reported Alcohol Consumption in the Last 12 Months.

We are interested in what things happen following the consumption of alcohol that make you regret getting drunk.

First of all, how many times did you get drunk in the last 12 months (we define drunk as having consumed so much that your physical and mental faculties are impaired to the point your balance/speech may be affected, you are unable focus on clearly on things and your conversation and behaviours are disinhibited).

Blank box.

If the answer to that question was greater than or equal to 1.

What % of these occasions did you regret getting drunk (regret means you wish you had drunk less or not drunk at all).

Blank box.

If the answer was greater than 0 then they saw the following:

Thinking back over the occasions you have regretted getting drunk what were the top three reasons why this happened?

1) drank too much too quickly;
2) mixed my drinks;
3) I was with big drinkers;
4) took other drugs at the same time;
5) I hadn't drank for a while due to COVID-19 restrictions;
6) I drank too much because of being on an online party;
7) I was feeling anxious about COVID/stuff going on in my life;
8) I mixed alcohol with medication;
9) I'd started drinking much earlier than normal and.
10) I drank something I usually did not drink (e.g. spirits).

Demographics

Age

How old are you? From 16- < 85.

Gender

Gender and sex were measured through two items which were then combined to make a composite variable using the Australian Bureau of Statistics 'Standard for Sex, Gender, Variations of Sex Characteristics and Sexual Orientation Variables' guidance.

How do you describe your gender? Gender refers to current gender, which may be different to sex recorded at birth and may be different to what is indicated on legal documents.

- Man or male
- Woman or female

- Non-binary
- I use a different term (please specify)

What was your sex recorded at birth?

- Male
- Female
- Another term (please specify)

The variable used in the analysis contains the following categories.

- Cis-woman
- Cis-man
- Trans/non-binary

Which Country Do You Live In?

Respondents selected their current country of residence.

What is Your Ethnicity?

White.
Black/African American.
Asian.
Hispanic/Latino.
Aboriginal/Māori.
Native American.
Mixed.
Other—Please specify.
For this study we compared White with all other ethnicities.

Are You Currently Studying?

Yes (full time).
Yes (part time).
No.

Are You Currently in Paid Employment?

Yes (Full-time).
Yes (Part-time < 35 h/week).
No (Looking for work).
No (Retired).
No (Undertaking home duties).

No (A non-working student).
No (Permanently ill or unable to work).
No (None of the above).
For this study we compared full time, part time and combined all the 'no' responses.

Have You Ever Been Diagnosed With?

ADHD; autism; depression; anxiety panic attacks or phobia, bipolar disorder; obsessive compulsive disorder, post-traumatic stress disorder; psychotic illness/schizophrenia; other; none of the above.

Respondents Who Reported Alcohol Use in the Last 12 Months Were Presented With the Alcohol Use Disorders Identification Test

How often do you have a drink containing **alcohol**?
Monthly or less.
2–4 times per month.
2–3 times a week.
4 or more times a week.
How many standard drinks do you have on a day when you drink?
1 or 2.
3 or 4.
5 or 6.
7 to 9.
10 or more.
How often do you have 6 or more drinks on one occasion?
Never.
Less than monthly.
Monthly.
Weekly.
Daily/almost daily.
How often during the last year have you found that you were not able to stop drinking once you had started?
Never.
Less than monthly.
Monthly.
Weekly.
Daily/almost daily.
How often during the last year have you failed to do what was normally expected of you because of drinking?
Never.
Less than monthly.
Monthly.
Weekly.
Daily/almost daily.

How often during the last year have you needed a drink in the morning to get yourself going after a heavy drinking session?

Never.

Less than monthly.

Monthly.

Weekly.

Daily/almost daily.

How often during the last year have you had a feeling of guilt or remorse after drinking?

Never.

Less than monthly.

Monthly.

Weekly.

Daily/almost daily.

How often during the last year have you been unable to remember what happened the night before because you had been drinking?

Never.

Less than monthly.

Monthly.

Weekly.

Daily/almost daily.

Have you or someone else been injured as a result of your drinking?

No.

Yes, but not in the last year.

Yes, during the last year.

Has a friend, relative, doctor, or other health worker been concerned.

about your drinking or suggested you cut down?

No.

Yes, but not in the last year.

Yes, during the last year.

AUDIT items are scored 0–4 other than the final two which are score 0 = never, 2 = yes but not in the last year, 4 = yes during the last year.

Data Availability The datasets generated and/or analysed during the current study are not publicly available due to contractual obligations but are available from the corresponding author on reasonable request.

Declarations

Ethical Statement All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study.

Conflict of Interest The authors have no conflicts of interest to declare.

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